

Final Report

LIMITED ENERGY STUDY, LOW PRESSURE TURBINE

FORT WAINWRIGHT, ALASKA

Prepared for

Department of the Army
U.S. Army Engineer District, Alaska
Anchorage, Alaska

Under

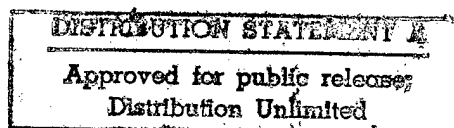
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This report has been prepared at the request of the client, and the observations, conclusions, and recommendations contained herein constitute the opinions of E M C Engineers, Inc. In preparing this report, EMC has relied on some information supplied by the client, the client's employees, and others which we gratefully acknowledge. Because no warranties were given with this source of information, E M C Engineers, Inc. cannot make certification or give assurances except as explicitly defined in this report.

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LIST OF ABBREVIATIONS

A	- ampere
Btu	British thermal unit
CNW	- condenser water
CNWP	- condenser water pump
CNWR	- condenser water return
CNWS	- condenser water supply
COE	- Corps of Engineers
ECIP	- Energy Conservation Investment Program
ECO	- Energy Conservation Opportunity
EMC	- E M C Engineers, Inc.
F	- Fahrenheit
ft	- foot, feet
ft ²	- square feet
gal	- gallons
gpm	- gallons per minute
GVEA	- Golden Valley Electric Association
Hg	- mercury
hp	- horsepower
hr	- hour
kV	- kilovolt, one thousand volts
kVA	- kilovolt-ampere
kW	- kilowatt, one thousand watts
kWh	- kilowatt-hours, one thousand watt-hours
lb/hr	- pounds per hour
LCCA	- Life Cycle Cost Analysis
MW	- megawatt, one-thousand kilowatts
O&M	- operation and maintenance
psia	- pounds per square inch absolute
psig	- pounds per square inch gage
rpm	- revolutions per minute
SIOH	- Inspection, and Overhead
SIR	- Savings-to-Investment Ratio
SOW	- scope of work
SPB	- simple payback
STM	- steam
temp	- temperature
TG	- turbine generator
yr	- year(s)

GLOSSARY OF TERMS AND DEFINITIONS

Backpressure Turbine - A steam turbine that exhausts to a pressure above atmospheric pressure. The exhaust steam is typically used for some type of heating process.

Condensing Turbine - A steam turbine in which the exhaust steam is condensed, typically in a condenser in which the pressure is below atmospheric pressure. The condensate is typically returned to the boiler.

Demand - The average value of power or related quality over a specified period of time. Demand is expressed in kilowatts, kilovolt-amperes, kilovars, or other suitable units.

Demand, Billing - The demand value upon which demand costs are based.

Demand Maximum - The highest demand measured over a specified period of time, typically one calendar month. Also referred to as peak demand.

Energy - The integral of active power with respect to time. Usually measured in watt-hours (Wh) or kilowatt hours (kWh).

Load - The load of an electric system is the demand in kilowatts. Often referred to more simply as "load" where the system, feeder, or piece of equipment referred to is clear from the context.

Volt (V) - The practical unit of electromotive force, or potential difference. One volt will cause one ampere to flow when impressed across a one ohm resistor (V). Also, kilovolt (kV).

Watt (W) - The practical unit of active power which is defined as the rate at which energy is delivered to a circuit. It is the power expended when a current of one ampere flows through a resistance of one ohm. Also, kilowatt (kW).

Watthour (Wh) - The practical unit of electric energy which expended in one hour when the average power during the hour is one watt. Also, kilowatt-hour (kWh) or one thousand watt hours.




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EXECUTIVE SUMMARY

INTRODUCTION

Authorization For Study

This study was performed and this report prepared under Contract No. DACA01-94-D-0033, Delivery Order No. 0002. The contract was issued by the Department of the Army, Mobile District, Corps of Engineers, to E M C Engineers, Inc. (EMC).

Purpose Of Study

The purpose of the study is to evaluate the installation of a low pressure, condensing turbine-generator at Ft Wainwright Power Plant (Power Plant). The low pressure turbine-generator would be installed downstream of an existing backpressure (10 psig exhaust) turbine-generator. Although not specifically in the scope of work, EMC also evaluated replacing the existing backpressure turbine-generator with a condensing turbine-generator.

POWER PLANT DATA

Power is generated at Ft. Wainwright Power Plant by four 5 MW nominal (6.25 MW max capacity) turbine generators. TG-3, 4 and 5 are condensing turbine-generators. TG-1 is a backpressure turbine-generator. TG-2 has been out of service for several years. Steam is extracted at 100 psig from each turbine-generator for base heating.

TG-1 exhaust pressure is 10 psig. This 10 psig steam was intended to be used for in-plant heating processes. The in-plant heating processes consists of deaerating heaters and water treatment systems. However, plant personnel indicated that TG-1 is only operated when the outside temperatures fall below -30°F.

Ft. Wainwright and Ft. Greely are served by Golden Valley Electric Association (GVEA). Power can be produced for Ft. Wainwright and Ft. Greely without purchasing power from GVEA when three 5 MW turbine-generators are operating. However, turbine-generators must be taken off-line periodically for routine maintenance or for component failures. Power must be purchased from GVEA when one or more turbine generators are off-line. Power is wheeled from Ft. Wainwright to Ft. Greely by the use of GVEA transmission lines.

ENERGY CONSERVATION OPPORTUNITIES

The energy conservation opportunity (ECO) evaluated by this study is to make modifications which allow TG-1 to be used as a standby turbine-generator throughout the year. These modifications should eliminate purchases of power from GVEA.

Description of Alternatives

Two alternatives were evaluated which allow TG-1 to be operational when TG-3, -4, or -5 require maintenance.

- Alternative 1 consists of replacing existing TG-1 with a new condensing turbine generator.
- Alternative 2 consists of installing a low pressure, condensing turbine-generator downstream of existing TG-1.

Energy Cost Savings

At present, TG-1 is operated as a standby power source when outside temperatures are below -30°F. Ft. Wainwright must purchase power from GVEA when TG-3, -4, or -5 are taken out of service for maintenance. A conversion of TG-1 to operate at temperatures above -30°F would eliminate purchases of electricity from GVEA when TG-3, -4, or -5 are taken out of service for maintenance.

The total annual amount of electrical energy required from GVEA for Ft. Wainwright is 1,161,010 kWh. The total annual cost for the electrical service was \$442,237 including energy and demand costs during the period from September 1993 to August 1994.

The total annual amount of electrical energy required from GVEA for Ft. Greely is 2,713,943 kWh. The total annual cost for the electrical service is \$541,970. This cost includes wheeling costs, energy and demand cost during the period September 1993 to August 1994.

Economic Analysis

The economic analysis of Alternative 1 and Alternative 2 are summarized in Table 1 below.

Table 1. Energy Conservation Analysis Summary

	Alternative 1	Alternative 2
Construction Cost	\$2,358,017	\$2,265,119
Total Investment*	\$2,619,929	\$2,593,561
Ft. Greely Annual Energy Savings	2,713,943 kWh	2,713,943 kWh
Ft. Greely Electrical Cost Savings	\$541,970	\$541,970
Ft. Wainwright Annual Energy Savings	1,161,010 kWh	1,161,010 kWh
Ft. Wainwright Electrical Cost Savings	\$442,237	\$442,237
Total Cost Savings	\$984,207	\$984,207
Additional Coal Costs	\$250,571	\$250,571
Wheeling Costs	\$242,450	\$242,450
Additional Maintenance Costs	\$14,460	\$15,960
Annual Cost Savings	\$476,726	\$475,226
SIR	3.99	4.02
Simple Payback	5.50	5.46

*Total investments include design costs, supervision, inspection and overhead (SIOH) costs, and salvage values.

Both Alternative 1 and 2 have savings to investment ratios (SIR) greater than 1.25 and simple payback (SPB) periods of less than 10 years. In addition, both alternatives have construction costs greater than \$300,000. Therefore, based on EMC's scope of work and Energy Conservation Investment Program (ECIP) Guidance, both alternatives qualify as ECIP projects.

The above energy cost savings are dependent on termination or renegotiation of the existing contract with GVEA. The following issues must be resolved:

- Ft. Wainwright and GVEA have a contract which specifies a minimum monthly charge of \$15,000 based on 2500 kW of demand. These charges would likely make the ECO uneconomical. This contract will require renegotiation and modification. If it cannot be renegotiated, then the contract can be terminated by either party by providing 180 day advance written notice.
- Ft. Wainwright must become independent of GVEA to fully realize the energy cost savings used in the economic analysis. If GVEA were to remain connected to Ft. Wainwright as a standby power source, GVEA would assess monthly demand charges based on the amount of standby power desired. Based on discussions with Power Plant personnel, it will not be a problem for Ft. Wainwright to become independent of GVEA

after the turbine generator is installed. In addition, Power Plant personnel believe that the addition of a turbine-generator may increase the Ft. Wainwright reliability beyond GVEA's reliability.

- Ft. Wainwright must continue to use GVEA transmission lines to wheel power to Ft. Greely. The 1992 Energy Act established new rules regarding wheeling of electric power. The Federal Energy Regulatory Commission (FERC) mandates that electric utilities provide electric transmission services for independent power producers. The FERC permits the electric utility to recover "all the costs incurred in connection with the transmission services and necessary associated services, including, but not limited to, an appropriate share, if any, of legitimate, verifiable, and economic costs...." No one really knows the definition of "economic costs" at this time. It will be up to the FERC to define this issue. However, it appears that GVEA will be allowed to assess a reasonable and justifiable wheeling charge which will probably not vary significantly from their present wheeling charges. Currently, the costs for use of GVEA transmission lines are 17.64% of the energy charge calculated under the GSII schedule dated 21 Sep 82. These costs have been included in the life cycle cost analysis.

RECOMMENDATIONS

1. Proceed to the design phase for a new turbine-generator. Fort Wainwright needs a standby generator to provide reliable electric service which Ft. Wainwright feels that GVEA has historically been unable to provide. This project would be justified for ECIP funding if Ft. Wainwright commits to terminating electrical service from GVEA while retaining the right to wheel power to Ft. Greely through GVEA at a reasonable cost.

It is recommended that Ft. Wainwright proceed into the design phase with this project. Simultaneously, Ft. Wainwright should enter into negotiations with GVEA to obtain more beneficial rates. After completion of the design phase and negotiations with GVEA, a decision would be made concerning actual construction.

It is likely that GVEA will be willing to renegotiate utility rates with Ft. Wainwright after GVEA realizes that Ft. Wainwright is planning to install the new turbine-generator. The installation of a new turbine-generator will allow Ft. Wainwright to become independent of GVEA (not including costs for wheeling electrical energy from Ft. Wainwright to Ft. Greely). Ft. Wainwright will obtain bargaining power because GVEA could potentially lose revenue from the sale of electrical services to Ft. Wainwright and Ft. Greely.

Although it does not appear to be the current situation, GVEA believes it can sell electricity to Ft. Wainwright for less money than it costs Ft. Wainwright to generate it when exhaust steam from the turbines must be condensed. In other words, it may be more economical for Ft. Wainwright to operate turbine-generators only in the cogeneration mode where 100 psig extraction steam is used for heating.

2. Alternative 1 for a new turbine-generator is recommended. Both alternatives qualify for ECIP funding assuming Ft. Wainwright will no longer pay GVEA demand charges and that wheeling charges will remain at current levels. EMC Engineers, Inc. recommends Alternative 1 because it is anticipated there will be less difficulty in construction, operation, and maintenance in comparison to Alternative 2.
3. Construct a utility model of the system. It is recommended that a utility model of thermal and electric energy use and cost at Ft. Wainwright and Ft. Greely be constructed and used to identify the most cost effective electricity generation or procurement strategy and to provide technical support for negotiations with GVEA. The utility model would examine the following issues:
 - The cost of continuing to purchase electricity from GVEA under the current rate structure.
 - Installation of a new turbine generator and termination of service from GVEA.
 - The economical benefit of various alternative GVEA rate structures with and without installation of a new turbine generator.
 - Other beneficial scenarios which may be identified once the utility model is complete.

The utility model may also identify other ECOs with better economics than those identified in this report.

The recommended additional analysis is beyond the scope of work for this delivery order.

1. INTRODUCTION

1.1 AUTHORITY FOR STUDY

This study was conducted and this report prepared under Contract No. DACA01-94-D-0033, Delivery Order No. 0002. The contract was issued by the Department of the Army, Mobile District, Corps of Engineers, to E M C Engineers, Inc. (EMC).

1.2 PURPOSE OF STUDY

The purpose of this study is to evaluate the installation of a low pressure, condensing turbine-generator. The low pressure turbine-generator would be installed downstream of an existing backpressure turbine generator.

1.3 BACKGROUND

Steam for heating and electricity for Ft. Wainwright are produced in Building 3595, the power plant. Power is wheeled from the Ft. Wainwright Power Plant (Power Plant) to Ft. Greely by the use of Golden Valley Electric Association (GVEA) transmission lines.

Steam at 400 psig and 650°F is produced in the power plant by six coal-fired boilers rated at 125,000 lb/hr each. The plant also has two 75,000 lb/hr boilers which are no longer in service.

Power is generated by four turbine-generators rated at 5 MW nominal (6.25 MW maximum capacity) each. Three of the turbine-generators (TG-3, TG-4, TG-5) have condensing turbines, and one turbine-generator (TG-1) has a backpressure turbine. TG-1 is not operated except when outside temperatures fall to -30°F. Steam can also be extracted at 100 psig from each of the turbines. This steam is used for base heating. Turbine-generator (TG-2) is a 2 MW unit which is no longer in service.

The turbine-generators are manually controlled to meet the electrical demand of Ft. Wainwright and Ft. Greely. Each turbine-generator is selected to produce a predetermined amount of power. The amount of power produced by each turbine-generator depends on the loads of Ft. Wainwright and Ft. Greely and several factors of Power Plant operating conditions.

There is a meter at the Power Plant intertie to the GVEA utility grid. The meter measures power provided to GVEA and power provided from GVEA.

Ft. Greely calls Ft. Wainwright hourly to indicate their required load. Ft. Wainwright can then supply the Ft. Greely load to the GVEA utility grid, taking into account transmission line losses.

1.4 SCOPE OF WORK

The Scope of Work (SOW) for the project is presented in Appendix A. In general, EMC's objective is to evaluate adding a low pressure turbine with inlet conditions of 10 psig steam. The source of 10 psig inlet steam is the exhaust from TG-1. Although not specifically in the scope of work, EMC also evaluated the alternative of replacing TG-1 with a condensing turbine-generator.

The SOW requires EMC to estimate costs for each option and then evaluate the options in terms of life cycle cost. The conclusions and recommendations are to be based on the life cycle cost analysis. The cost data, life cycle cost analysis, conclusions and recommendations, and related data are submitted in the format of interim and final reports.

The requirements for this report per §7.0 of the SOW consists of:

- Perform Limited Site Survey
- Combine ECOs Into Recommended Projects
- Prepare and submit Interim and Final Reports
- Presentation

The site survey and Interim Report have been completed. This document represents the Final Report. EMC was provided direction at the presentation for incorporating ECOs into recommended ECIP projects. The presentation occurred in January 1995. The Final Report includes the incorporation of review comments and preparation of ECIP documentation.

1.5 LIMITED SITE SURVEY

Limited site surveys (site observations) were completed during October 1994. The site observations consisted of plant walk-throughs, gathering data on equipment, review of existing drawings, and observations of mechanical and electrical systems pertaining to TG-1.

During the site observations, a meeting was held with representatives from the Power Plant, the Directorate of Public Works, and the Corps of Engineers, Alaska District. Confirmation Notice 1, in Appendix E, provides specific information on the meeting. A brief reiteration of the main discussions, decisions, and assumptions that resulted from the meeting are:

- It is not necessary to have a 10 psig steam source from TG-1. There is another source of 10 psig steam in the plant.
- Since 10 psig exhaust from TG-1 is not required, this study should include the option of replacing TG-1 with a condensing turbine-generator.
- EMC is to assume that there will be adequate condenser cooling capacity for the simultaneous operation of three 5 MW turbine-generators.
- When three turbine-generators rated at 5 MW nominal (6.25 MW maximum capacity) are operating, the power required for both Ft. Wainwright and Ft. Greely can be generated without purchasing power from Golden Valley Electric Association (GVEA). Electric demand for Ft. Wainwright is not expected to increase in the future.
- Currently, TG-1 can be operated only during periods when the outside temperature is below -30 F without dumping the exhaust steam.
- TG-3, -4, and -5 must be periodically taken off-line to clean the condensers. During this down time Ft. Wainwright must buy power from GVEA.
- Modifications to TG-1 will help ensure that three turbine generators are operational when maintenance for one turbine generator is necessary. Consequently, cost savings will result because the Government will avoid buying power from GVEA.

2. EXISTING CONDITIONS

2.1 GENERAL

Since the objective of the scope of work was to evaluate modifications at TG-1, the detailed survey data was collected for the turbine-generators only. The boilers and ancillary systems were surveyed with sufficient detail to support the turbine-generator analysis.

2.2 EXISTING MECHANICAL SYSTEMS DESCRIPTION

The power plant consists of five turbine-generators that are located at the plan level of 115 feet (turbine deck). The plan grade level is 100 feet. The turbine-generators are numbered 1 through 5. This report refers to them as TG-1 through TG-5. TG-2 has been out of service for several years. TG-1 and TG-3, -4 and -5 are nominal 5 MW (6.25 MW maximum capacity) turbine-generators. The existing arrangement of the TG steam piping is shown in Figure 2-1 on page 2-2.

Steam is provided by six coal-fired boilers rated at 125,000 lb/hr each. The boilers supply the main 12" steam header with 400 psig, 650°F (650°F design, 700°F operating) steam. Ten inch steam mains branch off of the steam header and are routed to the turbine-generator inlets.

TG-3, -4, and -5 exhaust the steam to a condenser (one condenser for each TG) at a pressure of 1 1/2" Hg. TG-1 exhaust steam pressure is 10 psig, which can be used for in-plant process heating. The in-plant heating processes consist of deaerating heaters and water treatment systems.

Steam can also be extracted from each turbine-generator at 100 psig which is connected to a header for base heating.

Plant personnel indicated that TG-1 is only operated when outside temperatures fall below -30°F which creates a large steam demand for base heating and in-plant heating processes. Similarly, the electrical demand increases as outside temperatures fall.

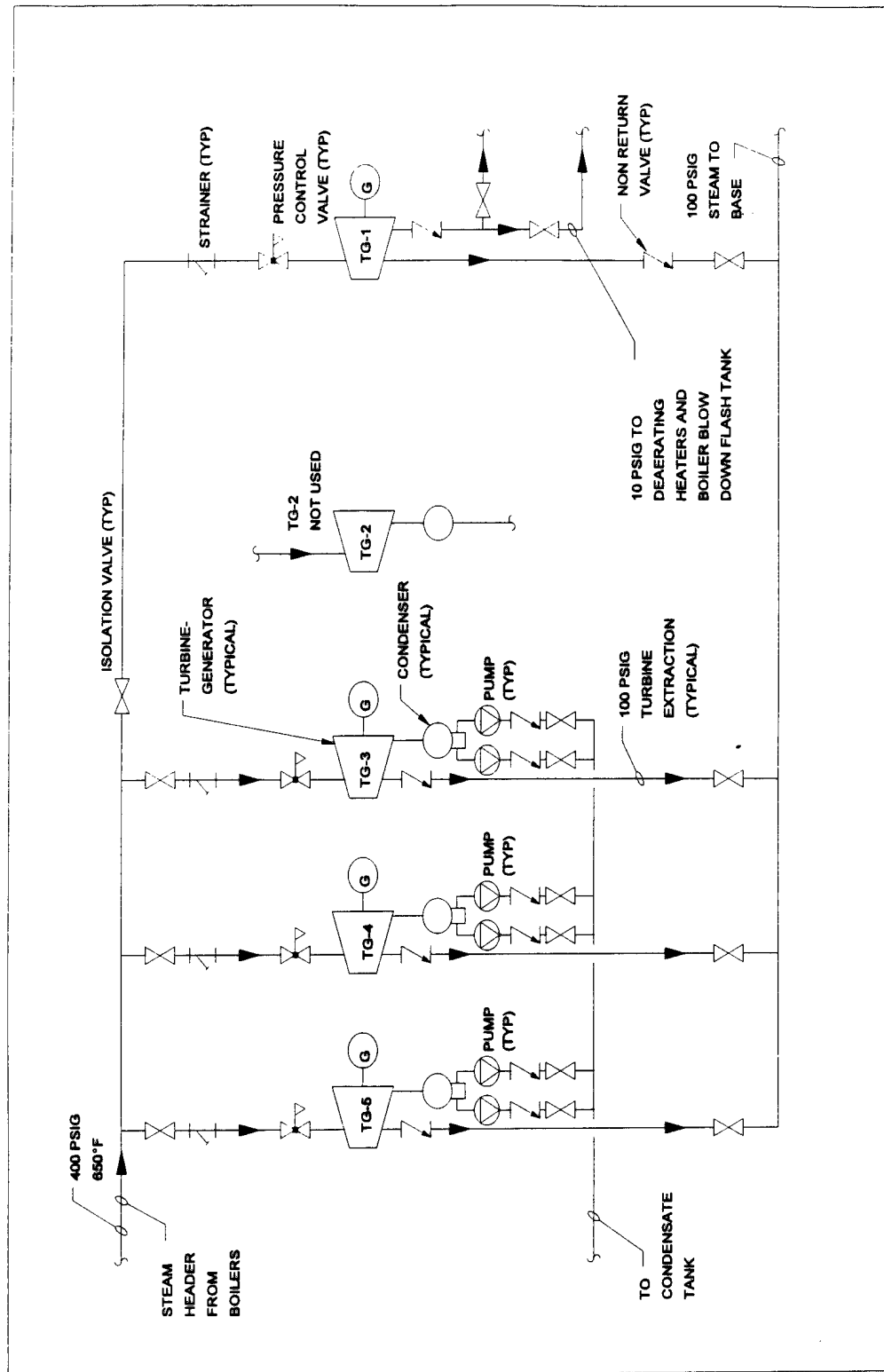


Figure 2-1. Existing TG Steam and Condensate Schematic

2.3 ELECTRICAL SYSTEMS DESCRIPTION

Metal-clad, 15 kV Class switchgear for the Ft. Wainwright Power Plant is located at the east side of the turbine deck. The switchgear is rated at 2000 amperes, 12.47 kV, 3 phase. The breakers in the switchgear are rated at 1200 amperes, 500 MVA, 3-pole, 13.8 kV maximum.

Discussions with Power Plant personnel during the site observations did not reveal any known deficiencies with the switchgear or breakers. The switchgear is represented schematically by the one-line diagram in Figure 2-2 on page 2-4. Although not shown in Figure 2-2, the switchgear also includes synchronizing equipment, protective relays, and auxiliary devices.

The switchgear receives, controls, and distributes power for Ft. Wainwright. The switchgear includes breakers for receiving power from the existing turbine-generators and for the GVEA intertie. Breakers are also included for feeders which distribute power to Ft. Wainwright and for station power.

One bus tie breaker separates the switchgear into two distinct busses. The North portion is referred to as 12.47 kV Bus #1, the South portion is referred to as 12.47 kV Bus #2.

Record drawings indicate that provisions for bus extensions have been included at both the northernmost and southernmost ends of the switchgear. These have been provided presumably to simplify expansion of the switchgear to include additional breakers in the future.

2.4 OPERATIONAL PROCEDURES AND PLANT DESIGN

As indicated by Power Plant personnel, the normal operating procedures at the Power Plant consist of operating TG-3, -4 and -5. In general, when TG-3, -4, and -5 are operating, the steam heating demand is provided for Ft. Wainwright, and electrical power is generated for Ft. Wainwright and Ft. Greely.

In addition to site observations, existing drawings were obtained to assist in report development. The drawings were used for confirming actual Power Plant construction and comparing the original design intent to actual operating conditions.

The heat balance diagram dated 20 June 1951 (not provided in this report) shows that the initial design intended TG-1 to run when outside temperatures are below 50°F. The original design indicated TG-1 was initially designed to be operated with substantial steam flows at outside temperatures of 40°F and below.

The original design inlet flows for TG-1 ranged from 62,000 lb/hr to 129,000 lb/hr over outside temperature ranges of 41°F to -50°F. At the same temperature ranges, the 100 psig extraction steam flow rate and the 10 psig exhaust steam flow rate for TG-1 are 7,000 lb/hr to 95,000 lb/hr and 55,000 lb/hr to 34,000 lb/hr, respectively.

In comparing the actual operating conditions and original design intent, it appears that the original design intent has not been obtained. Based on field and drawing observations, there may be additional cost saving opportunities by optimizing plant systems. That is, review the steam and electrical demands, then make modifications to the plant that will meet the demands more efficiently.

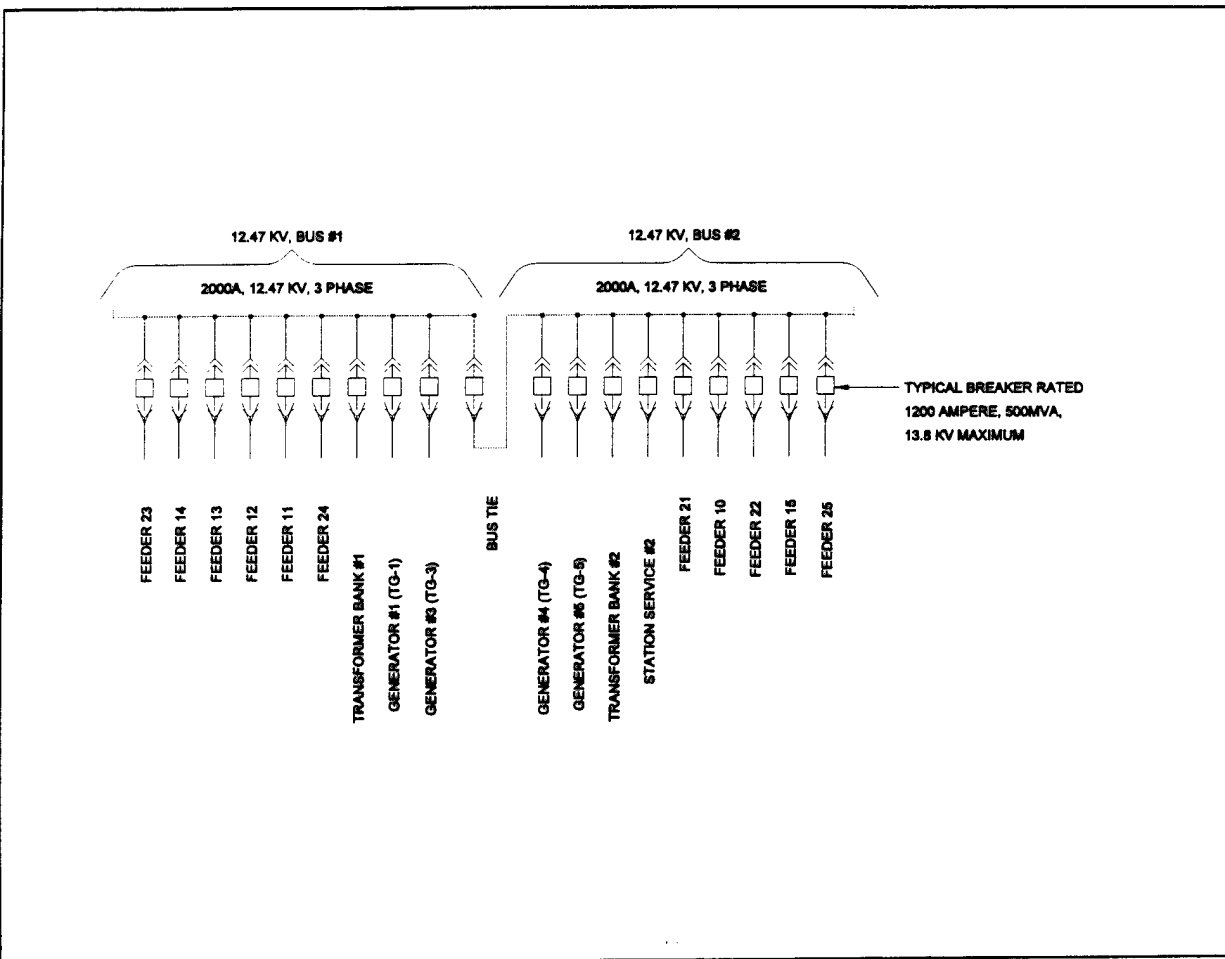


Figure 2-2. Existing 12.47 kV One-Line Diagram

3. EXISTING ENERGY USE AND COST

3.1 HISTORICAL ENERGY USE AND COST

The economics of the study are based on energy use and demand, and electrical cost which occurred during the period from September 1993 to August 1994 at Ft. Wainwright and Ft. Greely. The energy use (actual kWh), energy use cost, demand kW, minimum demand cost and total cost for Ft. Wainwright are summarized in Table 3-1 on page 3-3.

The minimum monthly billing from GVEA to Ft. Wainwright is the greater of the following:

- Customer Charge = \$40.00/month.
- Installed Capacity Charge at \$1.00/kVA/month.
 $7,500 \text{ kVA transformer capacity} - 7,500 \times \$1.00 = \$7,500/\text{month}.$
- Contract Capacity in kW x \$6.25 per kW/month.
 $2500 \text{ kW} \times \$6.25/\text{kW/month} = \$15,625/\text{month}.$
- The highest maximum monthly measured demand (ratchet demand) over the past 12 months is multiplied by \$6.25/kW.

Note: Regulatory Charges and Late Charges are in addition to the Minimum Monthly Billing.

The Ft. Wainwright monthly billing is the greater of the Minimum Billing or the current calculated billing. The current calculated billing is the sum of the billing demand cost plus the energy cost and miscellaneous charges.

Billing demand is the greater of the current month measured demand or 70% of the highest maximum monthly measured demand over the past 12 months.

Billing demand cost = billing demand x \$6.25/kW/month.

Ft. Greely electrical cost include energy use cost, demand charge, cost for power wheeled, and miscellaneous charges. The miscellaneous charges consist of customer charge, power adjustment, late charges, and regulatory charges. These costs are summarized in Table 3-2 on page 3-4. Ft. Greely is not subject to a demand ratchet kW such as Ft. Wainwright.

Refer to Appendix B for utility bills and the GVEA Utilities Service Contract.

3.2 POTENTIAL ENERGY SAVINGS

Table 3-1 on page 3-3 shows that the total annual cost for Ft. Wainwright purchasing electrical energy from GVEA is \$442,237. The total electrical energy provided by GVEA is 1,161,010 kWh.

The savings resulting from not purchasing electrical energy from GVEA is the total annual fees paid to GVEA minus the cost of producing the electrical energy at the Ft. Wainwright Power Plant.

The estimated cost for producing electrical energy at Ft. Wainwright is \$0.06/kWh. This estimate is based on actual turbine-generator steam rates and power output observed at the site, and coal with a heating value of 7,800 Btu/lb purchased at \$45/ton. This calculated estimate also agrees with the public works published rate. Refer to Appendix B for calculations on estimated Ft Wainwright energy costs and public works published costs.

The estimated cost for the Power Plant to produce the electrical energy to replace the energy provided by GVEA at Ft. Wainwright is \$0.06/kWh times 1,161,010 kWh, or \$69,660. Therefore, the resulting savings is \$442,237 minus \$69,660 or \$372,577. The economic analysis is based on this savings.

It should be noted that \$378,625 of the resulting \$442,230 savings are demand charges. GVEA has indicated that if Ft. Wainwright requires standby electrical service, they will be charged a demand fee even if Ft. Wainwright does not use any electricity. In order to avoid demand charges, Ft. Wainwright must become an independent power producer.

Table 3-2 on page 3-4 shows the total annual cost for Ft. Greely purchasing electrical energy from GVEA is \$541,970, including the cost of wheeling power from Ft. Wainwright to Ft. Greely.

The total electrical energy received at Ft. Greely is 16,317,360 kWh. GVEA provided 2,713,943 kWh of this electrical energy. The additional coal cost for the Power Plant to provide the 2,713,943 kWh, including line losses, is $(1.111)(2,713,943 \text{ kWh})(\$0.06/\text{kWh}) = \$180,911$. The total annual wheeling cost of 16,317,360 kWh including line loss, is \$242,452 for Ft. Wainwright to wheel the electrical energy from Ft. Wainwright to Ft. Greely.

Therefore, the resulting savings at Ft. Greely is annual billing less additional coal cost less wheeling cost or $541,970 - 180,911 - 242,452 = \$118,607$. The combined annual savings at Ft. Wainwright and Ft. Greely is $372,577 + 118,607 = \$491,184$. Table 3-3 on page 3-5 provides a summary of the savings.

Table 3-1. Energy Usage and Cost Provided to Ft. Wainwright by GVEA

Month	kW h	kW h Cost	kW	(1) Ratchet kW	(2) Minimum Billing	(3) Current Billing	(4) Adjustments	(5) Resulting Billing	(6) Invoice Billing
Sep	370	\$42	280	5,400	\$33,750	\$23,667	\$15	\$33,765	\$33,765
Oct	0	\$0	0	5,400	\$33,750	\$23,625	\$15	\$33,765	\$33,765
Nov	539,970	\$41,229	2,760	5,400	\$33,750	\$64,854	(\$10,681)	\$54,173	\$54,173
Dec	413,000	\$31,605	2,680	5,400	\$33,750	\$55,230	\$2,356	\$57,586	\$57,586
Jan	78,650	\$6,260	3,600	5,400	\$33,750	\$29,885	\$326	\$34,076	\$34,076
Feb	210	\$24	160	3,640	\$22,750	\$15,949	\$15	\$22,765	\$22,765
Mar	880	\$94	0	3,640	\$22,750	\$16,019	\$15	\$22,765	\$22,765
Apr	880	\$94	0	3,640	\$22,750	\$16,019	\$15	\$22,765	\$22,765
May	1,530	\$158	840	3,640	\$22,750	\$16,083	\$15	\$22,765	\$22,765
Jun	69,130	\$5,539	7,120	3,640	\$22,750	\$50,039	(\$1,281)	\$48,758	\$48,758
Jul	30,190	\$2,587	2,440	7,120	\$44,500	\$33,737	\$27	\$44,527	\$44,527
Aug	26,200	\$2,585	4,280	7,120	\$44,500	\$33,735	\$27	\$44,527	\$44,527
	1,161,010							\$442,237	\$442,237

- (1) The Ratchet kW is the highest monthly demand over the previous 12 months.
- (2) Minimum billing is the higher of the customer charge, installed capacity charge, contract capacity, or the Ratchet Demand.
- (3) The Current Billing is the kW h Cost for the month plus the calculated demand and cost.
The calculated demand and cost is the higher of (the current demand and or 70% of the Ratchet kW) times \$6.25.
- (4) Adjustments include the cost of power adjustment, the regulatory charge, and late charges.
- (5) The Resulting Billing is the higher of the Minimum and Current Billing.
- (6) Invoice Billings are values taken from monthly utility bills as a check on billing computations.

Table 3-2. Energy Usage and Cost Provided to Ft. Greely by GVEA

Month	1(FGR) Total kWh Received @ Ft. Greely	2 (FWO) Ft. Wain. Output to GVEA	3 (WE) Ft. Wain. Wheeled to Ft. Greely.	4 (PE) Ft. Greely kWh Recd. from GVEA	5 Cost of Electricity from GVEA to Ft. Greely	6 Cost of Wheeling to Ft. Greely	Demand kW	7 Demand Charge	8 Misc	Resulting Billing
Sep	1,249,440	1,411,310	1,254,655	(5,215)	\$0	\$16,829	2,424	\$15,150	\$55	\$32,034
Oct	1,396,800	1,493,260	1,327,508	69,292	\$5,552	\$17,803	2,736	\$17,100	(\$1,323)	\$39,132
Nov	1,531,680	1,168,380	1,038,690	492,990	\$37,667	\$13,941	2,904	\$18,150	(\$9,748)	\$60,010
Dec	1,591,680	1,145,270	1,018,145	573,535	\$43,773	\$13,667	2,904	\$18,150	(\$10,825)	\$64,765
Jan	1,563,840	1,843,700	1,639,049	(75,209)	\$0	\$21,969	2,976	\$18,600	\$55	\$40,624
Feb	1,483,920	1,423,250	1,265,269	218,651	\$16,873	\$16,971	2,904	\$18,150	(\$4,103)	\$47,891
Mar	1,572,000	1,322,760	1,175,934	396,066	\$30,320	\$15,776	2,784	\$17,400	(\$7,134)	\$56,362
Apr	1,365,600	1,201,590	1,029,226	336,374	\$25,796	\$13,815	2,688	\$16,800	(\$6,317)	\$50,094
May	1,214,400	1,326,000	1,131,561	82,839	\$6,578	\$15,183	2,544	\$15,900	(\$1,514)	\$36,147
Jun	1,116,000	984,850	839,954	276,046	\$21,223	\$11,284	2,256	\$14,100	(\$5,279)	\$41,328
Jul	1,092,000	967,630	832,337	259,663	\$19,982	\$11,182	2,184	\$13,650	(\$4,963)	\$39,851
Aug	1,140,000	1,251,190	1,051,089	88,911	\$7,038	\$14,107	2,280	\$14,250	(\$1,663)	\$33,732
TOTAL	16,317,360	15,539,190	13,603,417	2,713,943	\$214,802	\$182,527		\$197,400	(\$52,759)	\$541,970

1. Total kWhs into Ft. Greely read at the Ft. Greely meter = FGR.
2. kwh output from Ft. Wainwright Power Plant to GVEA measured at the Ft. Wainwright meter = FWO.
3. Amount of electricity wheeled to Ft. Greely from Ft. wainwright accounting for 11.1% line losses = WE=FWO-11.1%.
4. Ft. Greely purchased electricity from GVEA =PE=FGR-WE.
5. Cost of electricity purchased from GVEA is based on the GVEA GS-2 rate schedule.
6. Cost of wheeling electricity from Ft. Wainwright to Ft. Greely is 17.64% of the GVEA GS-2 rate schedule.
7. Demand charge is \$6.25 per kW.
8. Misc. adjustments account for customer charge, power adjustment, late charges & regulatory charges.

Table 3-3. Summary of Potential Annual Energy Savings

	Ft. Wainwright	Ft. Greely	Total
Current Electrical Services Costs	\$442,237	\$541,970	\$984,207
Added Coal Costs	(\$69,660)	(\$180,911)	\$(250,571)
Added Wheeling Cost		(\$242,452)	\$(242,452)
Total Savings	\$372,577	\$118,607	\$491,184

1. Additional Coal Cost:

Ft. Wainwright: 116,010 kWh (\$0.06/kWh) = \$69,660

Ft. Greely: (1.111)(2,713,943 kWh) = \$180,911

2. Wheeling cost for 16,317,360 kWh (1.111) = 18,128,586 kWh.

500 kWh at 0.1136 \$57
4500 kWh at 0.099 \$446
10,000 kWh at 0.934 \$934
18,113,587 kWh \$1,734,445

Wheeling cost = (\$1,374,445)(0.1764) = \$242,452.

4. ENERGY CONSERVATION OPPORTUNITIES

4.1 GENERAL

The SOW proposes adding a low pressure turbine-generator which would use the 10 psig exhaust steam from TG-1. This new turbine-generator would be operated as a standby unit for TG-3, -4, and -5 which must be periodically taken out of service for maintenance. The new turbine-generator should eliminate the purchase of electricity from GVEA.

EMC evaluated two alternatives which would allow TG-1 to be operational throughout the year. The result of having TG-1 operational is a cost savings by avoiding buying power from GVEA. The cost savings is summarized in Section 3.

Alternative 2 consists of a low pressure turbine which would use the 10 psig exhaust steam from TG-1. Alternative 1 would replace TG-1 with a condensing turbine-generator. There is no need for the 10 psig exhaust steam for in-plant heating processes because the 10 psig steam can be supplied from another source within the plant.

An alternative of installing a condenser that would maintain 10 psig backpressure on TG-1 was evaluated. It appeared that this alternative would not produce enough power and, therefore, was not considered further.

It is the understanding of EMC that in order to avoid charges from GVEA, Ft. Wainwright must become an independent power producer. That is, Ft. Wainwright cannot require GVEA to be on standby service. In conversations with representatives from GVEA, the standby service will be billed at the current rate schedule, \$6.25 per kW. For example, if 5,000 kW of standby service was required, then the monthly cost would be \$31,250. If Ft. Wainwright were to require standby service, then the economics of the alternatives discussed below will not be valid.

Ft. Wainwright personnel have indicated that Ft. Wainwright will not require standby service from GVEA. It was also noted that the University of Alaska, Eielson Air Force Base, and Clear Air Force Station are all independent of GVEA.

4.2 ALTERNATIVE 1

4.2.1 Description

Alternative 1 is shown in Figure 4-1 below. This alternative will require replacing the existing backpressure TG-1 with a nominal 5 MW condensing turbine-generator.

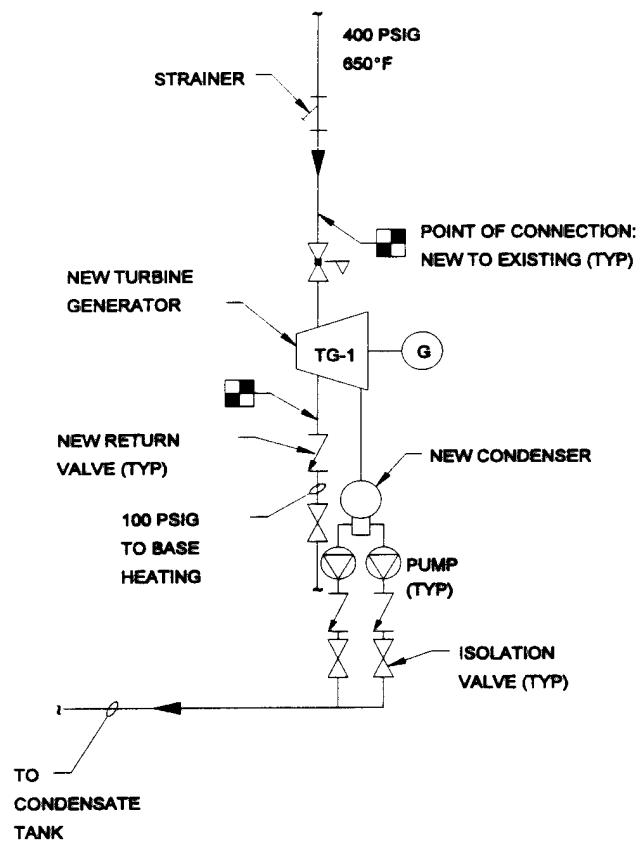


Figure 4-1. Alternative 1 - Replace Existing TG-1 With New Condensing TG

4.2.2 Required Modifications

TG-1 will be removed from the Power Plant in a manner that will allow it to remain operational. TG-1 will be dismantled on the foundation and broken down into pieces which can be picked up by the existing 14 ton overhead crane. The crane can load the turbine-generator components on a truck at the south end of the building. The operating hours on TG-1 are 140,616 (189 months). It is estimated that TG-1 will have a salvage value of approximately \$80,000. This salvage value was obtained with the assistance of companies that buy, sell, and rebuild used turbine-generators. The salvage value is used in the Life Cycle Cost Analysis summarized in Section 6.

The new turbine-generator can be installed on the existing foundation previously used for TG-1. The existing steam inlet piping and 100 psig extraction piping can be reused. Therefore, revisions to the inlet steam piping and 100 psig extraction piping will be minimal.

Since the new turbine-generator is a condensing unit, a new condenser must be installed. There is adequate room below the turbine deck for the location of the new condenser (in a manner similar to TG-3, -4, and -5).

New condenser cooling water piping will be required. The piping can be routed from the existing cooling water header to the new condenser (approximately 100 ft). As mentioned previously, EMC assumes there will be adequate capacity in the condenser cooling water system for the addition of the new turbine-generator condenser.

Condensate pumps and piping will be required for the new condenser. Condensate will be pumped from the condenser to the existing condensate receiver (approximately 120 ft).

Since the existing TG-1 will be replaced with a new condensing turbine-generator of equal capacity, the existing TG-1 breaker (breaker 8 of 12.47 kV Bus #1) has adequate capacity for use for the proposed new turbine-generator. Thus, the existing TG-1 breaker may be used for connecting the output of the new turbine-generator to the existing 12.47 kV Bus #1.

However, it is recommended that new power cables be provided between the new turbine-generator and the existing TG-1 breaker. Replacement of these power cables will help ensure that an operationally reliable installation is provided. Cost estimates for Alternative 1 include costs for the new power cables.

The power output of the new turbine-generator is 5 MW (6.69 MW maximum capacity) nominal. This will meet the electrical load requirements of Ft. Wainwright and Ft. Greely when two additional 5 MW turbine-generators are operating.

4.2.3 Economic Analysis

The cost estimate for Alternative 1 is \$2,358,017 (rounded to the nearest thousand). This cost estimate includes 14% overhead, 1% bond, 6.9% profit and 10% contingency. A 10% contingency was estimated instead of 20% contingency as in Alternative 2 because it is anticipated that construction of Alternative 1 will be less difficult than Alternative 2.

Maintenance costs are also include in the economic analysis. The maintenance costs are based on the scheduled down-time for cleaning the new condenser. Power Plant personnel indicated that the condenser will require cleaning twice a month during the summer and once a month during the winter. The total estimated down-time each time the condenser is cleaned is 18 hours. In addition to scheduled maintenance for condenser cleaning, an estimated cost of \$30,000 for the 20 year life of the turbine-generator was obtained from the manufacturer. The data for the turbine-generator maintenance is located in Appendix C, LCCA section.

Alternative 1 Savings to Investment Ratio (SIR) is 3.99 with a simple payback (SPB) of 5.5 years. The SIR is based on an economic life of 20 years.

The Life Cycle Cost Analysis (LCCA) total investment is \$2,619,929. This includes 8.5% SIOH, \$80,000 salvage value, and 6% design cost. The annual maintenance cost was estimated at \$14,460.

The LCCA and cost estimate is summarized in Section 6, and a detailed breakdown is provided in Appendix C.

4.3 ALTERNATIVE 2

4.3.1 Description

Alternative 2 consists of adding a new low pressure, 2.9 MW condensing turbine-generator downstream of the existing backpressure TG-1. The configuration is shown in Figure 4-2 on page 4-6.

4.3.2 Required Modifications

The new turbine generator will have inlet steam conditions of 10 psig (TG-1 exhaust) and exhaust conditions of 3" Hg.

The new low pressure turbine will also require a new condenser, cooling water piping, condensate return piping and condensate pumps as described above in

Alternative 1. However, electrical, structural, and demolition requirements will be different.

A new turbine-generator foundation must be constructed. It is anticipated that this foundation will be similar to the existing turbine-generator foundations. This will require a new foundation at grade level, supporting columns, cutting a penetration, and installing a new isolated foundation at the turbine deck.

Demolition requirements are rerouting existing TG-1 steam and miscellaneous piping in the anticipated location of the new low pressure turbine. The offices located on the turbine deck must be demolished.

Required modifications to the electrical system include installation of a new circuit breaker with relays and controls, and installation of new power cables between the output of the new turbine-generator and the new breaker.

Installation of the new circuit breaker is expected to be comprised of two switchgear sections. One switchgear section will contain the new air-break, 12.47 kV, 1200 ampere, 3-pole breaker. The second switchgear section will contain the protective relays associated with the new breaker and turbine-generator. The new switchgear sections may be located immediately adjacent and connected to the existing 12.47 kV switchboard.

Adequate space exists at the north end of the existing 12.47 kV switchboard. Interconnection of the new turbine-generator at the north end of the 12.47 kV Bus #1 conveniently places the new turbine-generator breaker on the same bus as the existing TG-1 bus (i.e., 12.47 kV Bus #1). Both the new turbine-generator breaker and the existing TG-1 breaker should be connected to the same 12.47 kV bus because the new turbine-generator and existing TG-1 are expected to operate at the same time. The addition of this new breaker for Alternative 2 is shown schematically in Figure 4-3 on page 4-7.

The power output of the new turbine generator is estimated at 2.9 MW at 80,000 lb/hr flow. Existing TG-1 can produce 2.5 MW at this flow rate according to the existing heat balance diagram (not provided in this report). Therefore, this arrangement will also meet the electrical load requirements of Ft. Wainwright and Ft. Greely when two additional 5 MW turbine-generators are operating.

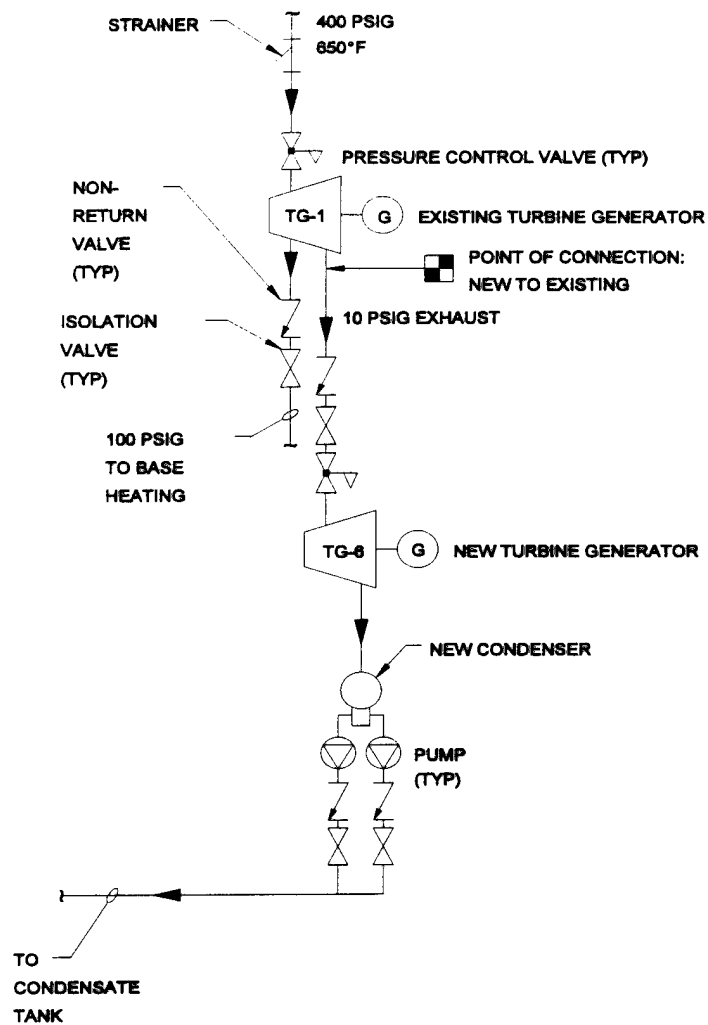


Figure 4-2. Alternative 2 - Install New TG Downstream of Existing TG-1

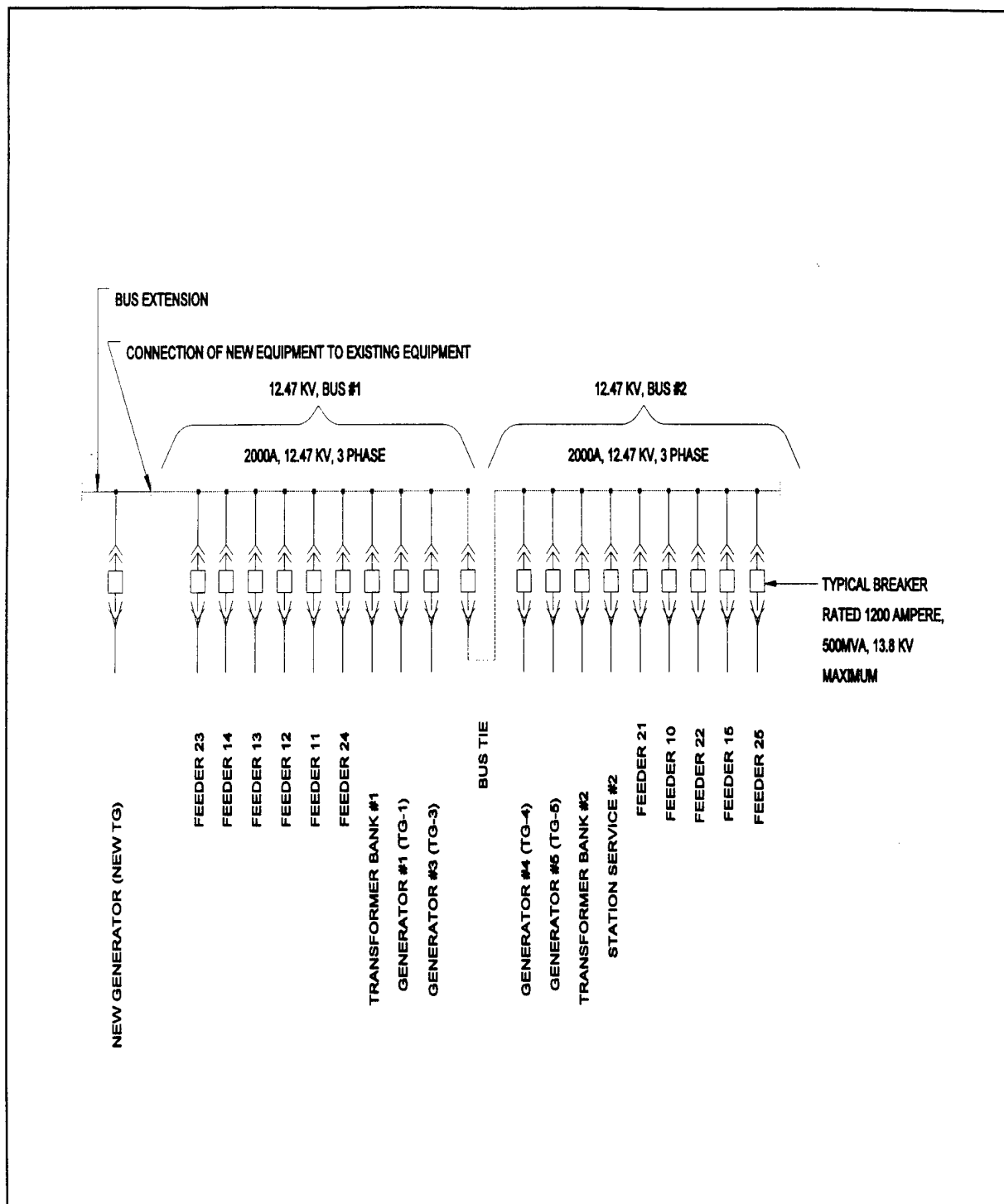


Figure 4-3. Alternative 2 - 12.47 KV One-Line Diagram

4.3.3 Economic Analysis

The cost estimate for Alternative 2 is \$2,265,119 (rounded to the nearest thousand). This cost estimate includes 14% overhead, 1% bond, 6.9% profit, and 20% contingency. (A 20% contingency was estimated instead of 10% contingency as in Alternative 1 in anticipation that construction of Alternative 2 may be more difficult than Alternative 1.)

Maintenance costs are also include in the economic analysis. The maintenance costs are based on the scheduled down-time for cleaning the new condenser. Plant personnel indicated that the condenser will require cleaning twice a month during the summer and once a month during the winter. The total estimated down-time each time the condenser is cleaned is 18 hours.

Maintenance costs for Alternative 2 is higher than Alternative 1 because there will be two turbine-generators which require general maintenance. As mentioned as Alternate 1, the estimated maintenance cost of the turbine-generator is \$30,000 over the 20 year life span. The total maintenance cost for two turbine-generators is \$60,000 over the 20 years.

The Alternative 2 SIR is 4.02 with a SPB of 5.46 years. The SIR is based on an economic life of 20 years.

The LCCA total investment is \$2,593,561. This includes 8.5% SIOH, and 6% design cost. The annual maintenance cost was estimated at \$15,960.

The LCCA and cost estimate is summarized in Section 6, and a detailed breakdown is provided in Appendix C.

5. ADDITIONAL CONSIDERATIONS

5.1 GENERAL

Alternatives 1 and 2 ECOs are based on savings obtained from installing a new condensing turbine-generator and producing power independently. Additional ECOs may be considered before or after the turbine-generator installation. Another possible ECO alternative may be to purchase power from GVEA during low steam heating demands which could be more cost effective than producing power at the Ft. Wainwright Power Plant.

In general, electric generation is rarely economically competitive with purchased power from a utility unless thermal energy is cogenerated at the same time. When exhaust steam from the turbines must be condensed, it is usually more cost effective to purchase the electricity.

Although GVEA may be able to provide electric energy at a lower cost, it is recommended that Ft. Wainwright install the turbine-generator to increase the reliability of its Power Plant. It is the opinion of Power Plant personnel that the Ft. Wainwright Power Plant is more reliable than electrical services from GVEA. This is based on observations of outages in previous years. It appears that the installation of a new turbine-generator would further increase the reliability of the Ft. Wainwright Power Plant. However, it is beyond the scope of this report to document and compare the reliability of GVEA and Ft. Wainwright.

Additional ECOs and plant upgrades may be found in studies for flue gas emissions, boiler operations, condenser cooling water systems, and condensate and boiler feedwater systems.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Both Alternative 1 and 2 have SIRs greater than 1.25 and simple payback periods of less than 10 years. Based on the ECIP Guidance document referenced in the SOW (dated 10 Jan 94), the minimum economic return for inclusion of an ECIP project is a SIR greater than 1.25 and a simple payback period that is less than 10 years. Therefore, the construction alternatives described in this report will qualify as ECIP projects.

In addition, both alternatives will achieve the power generation objective. That is, each alternative can generate power which will allow TG-3, -4 or -5 to be taken off line for maintenance. This will be able to be accomplished without buying power from GVEA.

The characteristics of Alternative 1 and 2 are summarized in Table 6-1 on page 6-2.

Ft. Greely must also purchase power from GVEA. The power purchased from GVEA by Ft. Greely was considered in the LCCA. EMC obtained records of historical electrical services for Ft. Greely. This data was used to determine the electrical services purchased by Ft. Greely from GVEA.

Table 6-1. Characteristics of Alternatives 1 and 2

	Alternative 1	Alternative 2
Construction Cost	\$2,358,017	\$2,265,119
Total Investment*	\$2,619,929	\$2,593,561
Ft. Greely Annual Energy Savings	2,713,943 kWh	2,713,943 kWh
Ft. Greely Electrical Cost Savings	\$541,970	\$541,970
Ft. Wainwright Annual Energy Savings	1,161,010 kWh	1,161,010 kWh
Ft. Wainwright Electrical Cost Savings	\$442,237	\$442,237
Total Cost Savings	\$984,207	\$984,207
Additional Coal Costs	\$250,571	\$250,571
Wheeling Costs	\$242,450	\$242,450
Additional Maintenance Costs	\$14,460	\$15,960
Annual Cost Savings	\$476,726	\$475,226
SIR	3.99	4.02
Simple Payback	5.50	5.46

*Total investments include design costs, supervision, inspection and overhead (SIOH) costs, and salvage values.

Both Alternative 1 and 2 have savings to investment ratios (SIR) greater than 1.25 and simple payback (SPB) periods of less than 10 years. In addition, both alternatives have construction costs greater than \$300,000. Therefore, based on EMC's scope of work and Energy Conservation Investment Program (ECIP) Guidance, both alternatives qualify as ECIP projects.

The above energy cost savings are dependent on termination or renegotiation of the existing contract with GVEA. The following issues must be resolved:

- Ft. Wainwright and GVEA have a contract which specifies a minimum monthly charge of \$15,000 based on 2500 kW of demand. These charges would likely make the ECO uneconomical. This contract will require renegotiation and modification. If it cannot be renegotiated, then the contract can be terminated by either party by providing 180 day advance written notice.
- Ft. Wainwright must become independent of GVEA to fully realize the energy cost savings used in the economic analysis. If GVEA were to remain connected to Ft. Wainwright as a standby power source, GVEA would assess monthly demand charges based on the amount of standby power desired. Based on discussions with Power Plant personnel, it will not be a problem for Ft. Wainwright to become independent of GVEA

after the turbine generator is installed. In addition, Power Plant personnel believe that the addition of a turbine-generator may increase the Ft. Wainwright reliability beyond GVEA's reliability.

- Ft. Wainwright must continue to use GVEA transmission lines to wheel power to Ft. Greely. The 1992 Energy Act established new rules regarding wheeling of electric power. The Federal Energy Regulatory Commission (FERC) mandates that electric utilities provide electric transmission services for independent power producers. The FERC permits the electric utility to recover "all the costs incurred in connection with the transmission services and necessary associated services, including, but not limited to, an appropriate share, if any, of legitimate, verifiable, and economic costs" No one really knows the definition of "economic costs" at this time. It will be up to the FERC to define this issue. However, it appears that GVEA will be allowed to assess a reasonable and justifiable wheeling charge which will probably not vary significantly from their present wheeling charges. Currently, the costs for use of GVEA transmission lines are 17.64% of the energy charge calculated under the GSII schedule dated 21 Sep 82. These costs have been included in the life cycle cost analysis.

6.2 RECOMMENDATIONS

1. Proceed to the design phase for a new turbine-generator. Fort Wainwright needs a standby generator to provide reliable electric service which Ft. Wainwright feels that GVEA has historically been unable to provide. This project would be justified for ECIP funding if Ft. Wainwright commits to terminating electrical service from GVEA while retaining the right to wheel power to Ft. Greely through GVEA at a reasonable cost.

It is recommended that Ft. Wainwright proceed into the design phase with this project. Simultaneously, Ft. Wainwright should enter into negotiations with GVEA to obtain more beneficial rates. After completion of the design phase and negotiations with GVEA, a decision would be made concerning actual construction.

It is likely that GVEA will be willing to renegotiate utility rates with Ft. Wainwright after GVEA realizes that Ft. Wainwright is planning to install the new turbine-generator. The installation of a new turbine-generator will allow Ft. Wainwright to become independent of GVEA (not including costs for wheeling electrical energy from Ft. Wainwright to Ft. Greely). Ft. Wainwright will obtain bargaining power because GVEA could potentially lose revenue from the sale of electrical services to Ft. Wainwright and Ft. Greely.

Although it does not appear to be the current situation, GVEA believes it can sell electricity to Ft. Wainwright for less money than it costs Ft. Wainwright to generate it when exhaust steam from the turbines must be condensed. In other words, it may be more economical for Ft. Wainwright to operate turbine-generators only in the cogeneration mode where 100 psig extraction steam is used for heating.

2. Alternative 1 for a new turbine-generator is recommended. Both alternatives qualify for ECIP funding assuming Ft. Wainwright will no longer pay GVEA demand charges and that wheeling charges will remain at current levels. E M C Engineers, Inc. recommends Alternative 1 because it is anticipated there will be less difficulty in construction, operation, and maintenance in comparison to Alternative 2.
3. Construct a utility model of the system. It is recommended that a utility model of thermal and electric energy use and cost at Ft. Wainwright and Ft. Greely be constructed and used to identify the most cost effective electricity generation or procurement strategy and to provide technical support for negotiations with GVEA. The utility model would examine the following issues:
 - The cost of continuing to purchase electricity from GVEA under the current rate structure.
 - Installation of a new turbine-generator and termination of service from GVEA.
 - The economic benefit of various alternative GVEA rate structures with and without installation of a new turbine generator.
 - Other beneficial scenarios which may be identified once the utility model is complete.

The utility model may also identify other ECOs with better economics than those identified in this report.

The recommended additional analysis is beyond the scope of work for this delivery order.

APPENDIX A
SCOPE OF WORK

1 AUG 94
GENSOW

GENERAL SCOPE OF WORK
CONTRACT NO.

Delivery Order No. 000

LIMITED ENERGY STUDY - LOW PRESSURE TURBINE
FORT WAINWRIGHT, AK

performed as part of the
ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

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ANNEXES

A - DETAILED SCOPE OF WORK

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C - REQUIRED DD FORM 1391 DATA

1.0 BRIEF DESCRIPTION OF WORK: The Architect-Engineer (A/E) shall:

1.1. Perform a limited site survey of specific buildings or areas to collect all data required to evaluate the specific ECOs included in this study.

1.2. Provide project documentation for recommended ECOs as detailed herein.

1.3. Prepare a comprehensive report to document all work performed, the results and all recommendations.

2.0 GENERAL:

2.1. This study is limited to the evaluation of the specific buildings, systems, or ECOs listed in Annex A, DETAILED SCOPE OF WORK.

2.2. The information and analysis outlined herein are considered to be minimum requirements for adequate performance of this study.

2.3. For the buildings, systems or ECOs listed in Annex A, all methods of energy conservation which are reasonable and practical shall be considered, including improvements of operational methods and procedures as well as the physical facilities. All energy conservation opportunities which produce energy or dollar savings shall be documented in this report. Any energy conservation opportunity considered infeasible shall also be documented in the report with reasons for elimination.

2.4. The study shall consider the use of all energy sources applicable to each building, system, or ECO.

2.5. The "Energy Conservation Investment Program (ECIP) Guidance", establishes criteria for ECIP projects and shall be used for performing the economic analyses of all ECOs and projects. A computer program, Life Cycle Cost In Design (LCCID), has been developed for performing life cycle cost calculations in accordance with ECIP guidelines and is referenced in the ECIP Guidance. This program is available commercially from the BLAST Support Office in Urbana, Illinois. The BLAST Support Office can be contacted at 1-800-842-5278. The latest version of the program should be used. If any program other than LCCID is proposed for life cycle cost analysis, it must use the mode of calculation specified in the ECIP Guidance. The output must be in the format of the ECIP LCCA summary sheet, and it must be submitted for approval prior to use.

2.6 Energy conservation opportunities determined to be technically and economically feasible shall be developed into projects acceptable to installation personnel. This may involve combining similar ECOs into larger packages which will qualify for ECIP or MCA funding, and determining in coordination with installation personnel the appropriate packaging and implementation approach for all feasible ECOs.

3.0 PROJECT MANAGEMENT:

3.1. Project Managers:

3.1.1 Project Manager: The A/E shall designate a project manager to serve as a point of contact and liaison for work required under this contract. Upon award of this contract, the individual shall be immediately designated in writing. This designated individual shall be responsible for coordination of work required under this contract.

3.1.2 Design Manager: The Contracting Officer will designate a design manager to serve as the Government's point of contact and liaison for all work required under this contract.

3.2. Installation Assistance: The Director of Public Works or authorized representative will designate an individual to assist the A/E in obtaining information and establishing contacts necessary to accomplish the work required under this contract.

3.3. Public Disclosures: The A/E shall make no public announcements or disclosures relative to information contained or developed in this contract, except as authorized by the Contracting Officer.

3.4. Meetings: Meetings will be scheduled whenever requested by the A/E or the Design Manager for the resolution of questions or problems encountered in the performance of the work. The A/E's project manager and the design manager shall be required to attend and participate in all meetings pertinent to the work required under this contract. These meetings, if necessary, are in addition to the presentation and review conferences.

3.5. Site Visits, Inspections, and Investigations: The A/E shall visit and inspect/investigate the site of the project as necessary and required during the preparation and accomplishment of the work.

3.6. Conferences and Confirmation Notices:

3.6.1. The A/E shall provide a record of all significant conferences, meetings, discussions, verbal directions, telephone conversations, etc., with Government representative(s) relative to this contract in which the A/E and/or designated representative(s) thereof participated. These records shall be dated and shall identify the contract number, and modification number if applicable, participating personnel, subject discussed and conclusions reached. the A/E shall forward to the Design Manager within ten calendar days, a reproducible copy of the records.

3.6.2. The A/E shall provide a record of requests for and/or receipt of Government-furnished material, data, documents, information, etc., which if not furnished in a timely manner, would significantly impair the normal progression of the work under this contract. The records shall be dated and shall identify the contract number and modification number, if applicable. The A/E shall forward to the Design Manager within ten calendar days, a reproducible copy of the record of request or receipt of material.

3.6.3. A review conference will be scheduled approximately 28 days after submittals. Review comments will be provided at this conference. These comments will become part of the

conference minutes forwarded to the A-E and annotated with conference action. Review comments provided to the A-E will not necessarily show coordination requirements with other parts of the submittal. The A-E shall incorporate the review comments into each part of the submittal as necessary.

3.7. Interview: The A/E shall conduct entry and exit interviews with the Director of Public Works or designated representative before starting work at the installation and after completion of the field work. The Design Manager shall schedule the interviews at least one week in advance and shall be in attendance.

3.7.1. Entry: The entry interview shall describe the intended procedures for the survey and shall be conducted prior to commencing work at the facility. As a minimum, the interview shall cover the following points:

- a. Schedules
- b. Names of energy analysts who will be conducting the site survey.
- c. Proposed working hours.
- d. Support requirements from the Directorate of Public Works.

3.7.2. Exit: The exit interview shall be conducted when the field work is complete. and briefly describe the items surveyed and probable areas of energy conservation.

4.0 SERVICES AND MATERIALS: All services, materials (except those specifically enumerated to be furnished by the Government), plant, labor, supervision and travel necessary to perform the work and render the data required under this contract are included in the lump sum price of the contract.

5.0 PROJECT DOCUMENTATION: All energy conservation opportunities which the A/E has considered shall be included in one of the following categories and presented in the report as such:

5.1. ECIP Projects: To qualify as an ECIP Project, an ECO, or several ECOs which have been combined, must have a construction cost estimate greater than \$300,000. The overall project and each discrete part of the project shall have an SIR greater than 1.25. Projects which qualify for ECIP funding shall be identified, separately listed, and prioritized by the Saving to Investment Ratio (SIR). Programming documentation shall consist of a DD Form 1391, life cycle cost analysis (LCCA) summary sheet(s) (with necessary backup data to verify the numbers presented), and a Project Development Brochure (PDB). A life cycle cost analysis summary sheet shall be developed for each ECO and for the overall project when more than one ECO are combined. The energy savings for projects consisting of multiple ECOs must take into account the synergistic effects of the individual ECOs.

5.2. NON-ECIP Projects: Projects which do not meet ECIP criteria, but which have an SIR greater than 1.25 shall be documented and ranked in order of highest to lowest SIR. Projects or ECOs shall be provided with the following documentation: the life cycle cost analysis (LCCA) summary sheet completely filled out; a description of the work to be accomplished; backup data for the LCCA, ie: energy savings calculations and cost estimate(s); and the simple payback period. The energy savings for projects consisting of multiple ECOs must take into account there synergistic effects of the individual ECOs. In addition these projects shall have the necessary documentation

prepared, as required by the Government's representative, for one of the following categories:

- a. Regular Military Construction Army (MCA) Program. This program is for projects which have a total cost greater than \$300,000.00 and a simple payback period of ten to twenty-five years. Documentation shall consist of DD Form 1391 and a Project Development Brochure.
- b. Low Cost/No Cost Projects. These are projects which the Directorate of Public Works (DPW) can perform using its resources. Documentation shall be as required by DPW.

5.3. Nonfeasible ECOs: All ECOs which the A/E has considered but which are not feasible, shall be documented in the report with reasons and justifications showing why they were rejected.

6.0 DETAILED SCOPE OF WORK: The Detailed Scope of Work is contained in Annex A.

7.0 WORK TO BE ACCOMPLISHED:

7.1. Review Previous Studies: Not Used.

7.2. Perform a Limited Site Survey: The A/E shall obtain all necessary data to evaluate the ECOs or projects by conducting a site survey. The A/E shall document his site survey on forms developed for the survey, or standard forms, and submit these completed forms as part of the report. All test and/or measurement equipment shall be properly calibrate prior to its use.

7.3. Reevaluate Selected Projects: Not Used.

7.4. Evaluate Selected ECOs: Not Used.

7.5. Combine ECOs Into Recommended Projects: At the interim review conference, the A/E will be provided direction of the packaging or the combining of ECOs for programming purposes and also indicate the fiscal year for which the programming or implementation documentation shall be prepared. Some projects may be a combination of several ECO's, and others may contain only one.

7.6. Submittals: The work accomplished shall be fully documented by a comprehensive report. The report shall have a table of contents and shall be indexed. Tabs and dividers shall clearly and distinctly divide sections, subsections, and appendices. All pages shall be numbered. Names of the persons primarily responsible for the project shall be included.

7.6.1. Interim Submittal: An interim report shall be submitted for review after the field survey has been completed and an analysis has been performed on all of the ECOs. The report shall indicate the work which has been accomplished to date, illustrate the methods and justifications of the approaches taken and contain a plan of the work remaining to complete the study. Calculations showing energy and dollar savings, SIR, and simple payback period of all the ECOs shall be included. The survey forms completed during this audit shall be submitted with this report. The survey forms only may be submitted in final form with this submittal. They should be clearly

marked at the time of submission that they are to be retained. They shall be bound separately in a standard three-ring binder. The A/E shall submit the Scope of Work and any modifications to the Scope of Work as an appendix to the report. A narrative summary describing the work and results to date shall be a part of this submittal. The final report and all appendices shall be bound in standard three-ring binders which will allow repeated disassembly and reassembly.

7.6.2. Final Submittal: The A/E shall prepare and submit the final report when all sections of the report are 100% complete and all comments from the interim submittal have been resolved. The A/E shall submit the Scope of Work for the study and any modifications to the scope of Work as an appendix to the submittal. The report shall contain a narrative summary of conclusions and recommendations, together with all raw and supporting data, methods used, and sources of information. The report shall integrate all aspects of the study. The recommended projects, as determined in accordance with paragraph 5, shall be presented in order of priority by SIR. The final report and all appendices shall be bound in standard three-ring binders which will allow repeated disassembly and reassembly. The final report shall be arranged to include:

- a. An Executive Summary to give a brief overview of what was accomplished and the results of this study using graphs, tables and charts as much as possible (See Annex B for minimum requirements).
- b. The narrative report describing the problem to be studied, the approach to be used, and the results of this study.
- c. Documentation for the recommended projects (includes I.CCA Summary Sheets).
- d. Appendices to include as a minimum:
 - 1) Energy cost development and backup data
 - 2) Detailed calculations
 - 3) Cost estimates
 - 4) Computer printouts (where applicable)
 - 5) Scope of Work

7.7 Presentation: The A/E shall give a formal presentation of the interim submittal to the installation, command, and other Government personnel. Slides or view graphs showing the results of the study to date shall be used during the presentation. During the presentation, the personnel in attendance shall be given ample opportunity to ask questions and discuss any changes deemed necessary to the study. The presentation will be conducted the same day as the review conference.

AUGUST 1 1994

EEAPFTW

ANNEX A

DETAILED SCOPE OF WORK
CONTRACT NO. :
Delivery Order No. 000

1.0 General Information.

1.1 The Architect-Engineer (A-E) shall furnish all services, materials, supplies, labor, equipment, investigations, studies, supervision, and travel as required in connection with this Statement of Work (SOW), and all furnished and referenced instructions.

1.1.1 This SOW is organized as follows:

Paragraph TOPIC

- 1.0 General Information
- 2.0 Project Criteria
- 3.0 Cost and Scope Limitations
- 4.0 Delivery Schedule
- 5.0 Architect Engineer Services
- 6.0 Initiation Of Work
- 7.0 Government Review
- 8.0 Travel
- 9.0 Submittals

1.1.3 Project Description: The AE will be required to conduct a limited site survey, evaluate energy and cost savings, construction costs, and the savings to investment ratio (SIR) associated with installing a low pressure (10 psi) condensing turbine/generator set to one of the existing turbines in the Fort Wainwright Central Heat and Power Plant. The AE shall investigate the turbine, and prepare a comprehensive report documenting all work performed, the results, and recommendations.

2.0 Project Criteria:

2.1 Government Furnished Materials and Equipment.

- a. US Army Corps of Engineers, Architectural and Engineering Instructions - Design Criteria, 14 July 1989.
- b. Energy Conservation Investment Program (ECIP) Guidance, dated 10 Jan 1994.
- c. TMS-785, Engineer Weather Data

- d. AR 420-49, Heating, Energy Selection and Fuel Storage, Distribution, and Dispensing Systems.
- e. Tri-Service Military Construction Program (MCP) Index, dated 28 February 1991.
- f. MCACES-Gold cost estimating guidance, program and database, diskettes, and licensing agreement.

3.0 Cost and Scope Limitations:

3.1 Cost Limitation: The construction cost limitation for this project is undefined. The AE will be responsible for developing the cost based upon the scope constraints for this project.

3.2 Cost Estimate:

3.1.2 Cost Estimate Format: Cost estimates shall be prepared using the latest version of Micro Computer Aided Cost Engineering System (MCACES)-GOLD, Version 5.20J or greater, with the appropriate labor equipment and material data bases. MCACES-GOLD will be provided to the A-E by the Cost Engineering Branch of the Alaska District Corps of Engineers at no cost. Upon completion of the contract, the A-E will return all material to the Government. The Alaska District is using a Standardized Work Breakdown Structure (WBS) for all military and civil work cost estimates. Corps format for cost estimates will be made available for use on other cost estimate requirements.

4.0 Delivery Schedule: The work, other related data, and services required in accordance with the contract shall be accomplished within the limitation of projects' scope. The schedule for delivery of data to the Contracting Officer is in calendar days. Calendar days for each requirement extend from the date of the Notice to Proceed (NTP) or approval for each item, except as otherwise noted.

	<u>Item</u>	<u>Delivery Schedule</u>	<u>Review/Conference Time/Location</u>
(a)	Interviews and Site Survey	14 days following NTP	Not Required
(b)	Interim Submittal	60 days following approval	28 days / Post
(c)	Final Submittal	21 days following Interim Rev. Conf.	Not required

NOTE: The contractor shall not proceed to the Interim Submittal without written notice from the Contracting Officer/authorized representative.

5.0 Architect-Engineer Services:

5.1 Interim Submittal: The interim submittal shall fulfill the requirements of the

paragraph 7.6.1 of the General Scope of Work.

5.2 Final Submittal: The final submittal shall fulfill the requirements of paragraph of the General Scope of Work. The A-E shall incorporate all interim review conference comments. The Government may back-check all documents which comprise this submittal. The documents, if found incomplete, shall be returned to the A-E for further work which shall be performed at no additional cost to the Government.

6.0 Initiation of Work: The AE shall not proceed nor initiate any work nor any succeeding design level of the work required under this SOW prior to receipt of award. Any work done without being directed to do so by the Contracting Officer/authorized representative shall be at the AE's own risk.

7.0 Government Review:

7.1 Value Engineering: Not Used.

7.2 Review: The Contracting Officer or his authorized representative may furnish the AE review comments on the data submitted. The AE shall incorporate all accepted review comments in the development of data for the next submittal. The AE will not be required to incorporate comments that may be categorized as "designer preference." If any review comment requires clarification and/or amplification to assure compliance, the AE shall notify the Contracting Officer or his authorized representative in writing.

8.0 Travel: Out of town travel is anticipated to Ft. Wainwright at Fairbanks, Alaska.

9.0 Submittals: All submittals shall be received at the Alaska District Engineer Offices, Design Management Section, Military Technical Engineering Branch in accordance with the design schedule in Section 4.0 above.

9.1 A dated submittal letter shall be provided with each submittal to the Contracting Officer with distribution to agencies listed. This letter shall indicate to whom and the number of copies to be mailed to the agencies listed via overnight, hand, or telefax delivery service by the AE.

9.2 The A/E shall make direct distribution of correspondence, minutes, report submittals, and responses to comments as indicated by the following schedule:

AGENCY

EXECUTIVE SUMMARIES
REPORTS
CORRESPONDENCE
FIELD NOTES

Commander, 6th Infantry Division (Light)
ATTN: APVR-FW-PW-E (Holtry)
Building 3015, Fort Wainwright, AK 99703

✓
7 7 1 1*

Commander, 6th Infantry Division (Light)
ATTN: APVR-PW-O (Berg)
Building 730, Fort Richardson, AK 99505-5500

3 3 1 -

Commander, USAED, Mobile
ATTN: CESAM-EN-CC, (Battaglia)
P.O. Box 2288, Mobile, AL 36628-0001

1 1 1 -

Commander, USAED, Alaska
ATTN: CENPA-EN-TE-DM, (Lenz)
P.O. Box 898, Anchorage, AK 99506-0898

7 7 7 1*

Commander, USAED, Alaska
ATTN: CENPA-CO-FR (Shuman)
P.O. Box 35066, Fort Wainwright, AK 99703-0066

1 1 1 -

Commander
US Army Logistics Evaluation Agency
ATTN: LOEA-PL (Mr. Keath)
New Cumberland Army Depot
New Cumberland, PA 17070-5007

1 - - -

Commander
US Army Corps of Engineers
ATTN: CEMP-ET (Mr. Gentil)
20 Massachusetts Avenue, NW
Washington, D.C. 20314-1000

1 - - -

* Field Notes Submitted in final form at interim submittal

21 19 11 2

ANNEX B

EXECUTIVE SUMMARY GUIDELINE

1. Introduction.
2. Building Data (types, number of similar buildings, sizes, etc.)
3. Present Energy Consumption of Buildings or Systems Studied.

- o Total Annual Energy Used.
- o Source Energy Consumption.

Electricity - KWH, Dollars, BTU
Fuel Oil - GALS, Dollars, BTU
Natural Gas - THERMS, Dollars, BTU
Propane - GALS, Dollars, BTU
Other - QTY, Dollars, BTU

4. Reevaluated Projects Results.
5. Energy Conservation Analysis.

- o ECOS Investigated.
- o ECOS Recommended.
- o ECOS Rejected. (Provide economics or reasons)
- o ECIP Projects Developed. (Provide list)*
- o Non-ECIP Projects Developed. (Provide list)*
- o Operational or Policy Change Recommendations.

* Include the following data from the life cycle cost analysis summary sheet: the cost (construction plus SIOH), the annual energy savings (type and amount), the annual dollar savings, the SIR, the simple payback period and the analysis date.

6. Energy and Cost Savings.

- o Total Potential Energy and Cost Savings.
- o Percentage of Energy Conserved.
- o Energy Use and Cost Before and After the Energy Conservation Opportunities are Implemented.

ANNEX C

REQUIRED DD FORM 1391 DATA

To facilitate ECIP project approval, the following supplemental data shall be provided:

- a. In title block clearly identify projects as "ECIP."
- b. Complete description of each item of work to be accomplished including quantity, square footage, etc.
- c. A comprehensive list of buildings, zones, or areas including building numbers, square foot floor area, designated temporary or permanent, and usage (administration, patient treatment, etc.).
- d. List references, and assumptions, and provide calculations to support dollar and energy savings, and indicate any added costs.
 - (1) If a specific building, zone, or area is used for sample calculations, identify building, zone or area, category, orientation, square footage, floor area, window and wall area for each exposure.
 - (2) Identify weather data source.
 - (3) Identify infiltration assumptions before and after improvements.
 - (4) Include source of expertise and demonstrate savings claimed. Identify any special or critical environmental conditions such as pressure relationships, exhaust or outside air quantities, temperatures, humidity, etc.
- e. Claims for boiler efficiency improvements must identify data to support present properly adjusted boiler operation and future expected efficiency. If full replacement of boilers is indicated, explain rejection of alternatives such as replace burners, nonfunctioning controls, etc. Assessment of the complete existing installation is required to make accurate determinations of required retrofit actions.
- f. Lighting retrofit projects must identify number and type of fixtures, and wattage of each fixture being deleted and installed. New lighting shall be only of the level to meet current criteria. Lamp changes in existing fixtures is not considered an ECIP type project.

PROFIT EVALUATION SHEET
Weighted Guideline Method
RFP/Contract No. _____
Modification/DO No. _____

<u>Factor</u>	<u>Rate</u>	<u>Weight</u>	<u>Value</u>
Degree of Risk	25	_____	_____
Relative Difficulty of Work	20	_____	_____
Size of Job	15	_____	_____
Period of Performance	20	_____	_____
Contractor's Investment	5	_____	_____
Assistance by Government	5	_____	_____
Subcontracting	10	_____	_____
TOTAL	100%	PROFIT	_____

Explanation of Weight Assigned--

Degree of Risk: _____

Relative Difficulty of Work: _____

Size of Job: _____

Period of Performance: _____

Contractor's Investment: _____

Assistance by Government: _____

Subcontracting: _____

Based on the circumstances of the procurement action, each of the above factors shall be weighted from .07 to .15 as indicated below. "Value" shall be obtained by multiplying the rate by the weight. The Value column when totaled indicates the fair and reasonable profit percentage under the circumstances of the particular procurement.

Degree of Risk: Where the work involves no risk or the degree of risk is very small, the weighting should be .07; as the degree of risk increases, the weighting should be increased up to a maximum of .15. For construction work, lump sum items shall generally have a higher weight than unit price items; other things to consider include the nature of the work and where it is to be performed, etc. AE contracts with options shall generally have a higher weighted value than contracts without options; other things to consider include nature of design, responsibility for design, amount of principal time required, etc. For all types of contracts consider the portion of the work to be done by subcontractors, amount and type of labor included in costs, whether the negotiation is before or after performance of the work, etc. Modifications settled before the fact have much greater risk than those settled after the fact. A weight of .07 is appropriate for after the fact equitable adjustments and/or settlements.

Relative Difficulty of Design: If the design is most difficult and complex the weighting should be .15 and should be proportionately reduced to .07 on the simplest of jobs. This factor is tied-in to some extent with the degree of risk. Some things to consider are: the nature of the design, by whom it is to be done, i.e. subcontractor, consultants, what is the schedule, etc., and it is rehab or new work.

Size of Job: All work and fees not in excess of \$50,000 shall be weighted at .15. Work estimated between \$50,000 and \$500,000 shall be proportionately weighted from .15 to .09. Work from \$500,000 to \$1,000,000 shall be proportionately weighted from .09 to .07. Work in excess of \$1,000,000 shall be weighted at .07. It should be noted that control of fixed expenses generally improves with increased job magnitude.

Period of Performance: Work in excess of 24 months (180 days actual time) are to be weighted at .15. Work of lesser duration shall be proportionately weighted from .07 to .15 for work not exceeding 60 days.

Contractor's Investment: To be weighted from .07 to .15 on the basis of below average, average, and above average. Things to consider include amount of subcontracting, Government-furnished property or data such as surveys, soil tests, method of making progress payments, etc.

Assistance by Government: To be weighted from .15 to .07 on the basis of average to above average. For construction consider use of Government-owned property, equipment and facilities, expediting assistance, etc. For AEs consider use of as-built drawings, Government surveys, soil exploration, and foundation recommendations.

Subcontracting: To be weighted inversely proportional to the amount of subcontracting. Where 80% or more of the work is to be subcontracting use .07. The weighting should be increased proportionately to .15 where all the work is performed by the contractor's own forces.

APPENDIX B

**ENERGY COST DEVELOPMENT, UTILITY BILLS AND GVEA
UTILITY SERVICES CONTRACT**

**Estimated Cost of Energy for
Ft. Wainwright Power Plant**

E M C ENGINEERS, INC.

2750 S. Wadsworth Blvd. 9755 Dogwood Rd.
 Suite C-200 Suite 220
 Denver, CO 80227 Roswell, GA 30075
 (303) 988-2951 (404) 642-1864

JOB FT. WADSWORTH THERMAL STUDYSHEET NO. 1 OF 1CALCULATED BY BR DATE 11/21/97

CHECKED BY _____ DATE _____

SCALE _____

ESTIMATED ENERGY COST FOR FT. WADSWORTH

1. FROM FIELD OBSERVATIONS AT EXISTING TG-5, STRAIGHT CONDENSING,

$$\text{POWER OUTPUT} = 3200 \text{ KW}$$

$$\text{STEAM FLOW (Ave.)} = 40,000 \text{ LB/HR}$$

$$\text{THEN ACTUAL STEAM RATE} = \frac{40,000 \text{ LB/HR}}{3200 \text{ KW}} = 12.53 \frac{\text{LB}}{\text{HR KW}}$$

2. ENTHALPY OF STEAM AT 40 PSIG AND 650°F =
- $h = 1336 \text{ BTU/LB}$

ENERGY REQUIRED FOR PRODUCING STEAM RATE =

$$1336 \frac{\text{BTU}}{\text{LB}} \left(12.53 \frac{\text{LB}}{\text{HR KW}} \right) = 16,700 \frac{\text{BTU}}{\text{HR KW}}$$

3. HEATING VALUE OF COAL = 7800 BTU/LB (FROM PLANT PERSONNEL)

ASSUMING 80% BOILER EFFICIENCY; REQUIRED COAL =

$$\frac{16,700 \frac{\text{BTU}}{\text{HR KW}}}{(0.8)(7800 \text{ BTU/LB})} = 2.68 \frac{\text{LB}}{\text{KWHR}}$$

4. COST OF COAL = \$45/TON (FROM PLANT PERSONNEL)

$$5. \text{COST PER KWHR} = 2.68 \frac{\text{LB}}{\text{KWHR}} \left(\frac{\$45}{2000 \text{ LB}} \right) = \$0.06/\text{KWHR}$$

AGREES WITH GOVERNMENT PROVIDED RATES

JAN-31-95 TUE 11:12

PW-BUS MGMT

FAX NO. 3843062

P.02

GOVERNMENT PROVIDED RATES

Installation
Fort Wainwright
Date 19 May 1993

Current Rates
for
FY 93
H

Current Rates
for
FY 94
H B

Electricity
Plant
Distribution

A H B
\$0.0494 N/A \$0.0572
\$0.0505 \$0.0505 \$0.0711

A H B
\$0.0513 N/A \$0.0513
\$0.0563 \$0.0630 \$0.0687

Steam
Plant
Distribution

\$5.4147 N/A \$5.7639
\$6.8561 \$6.8561 \$7.5434

\$5.4979 N/A \$5.8515
\$6.8999 \$6.8999 \$7.2795

Water

\$1.0091 \$1.0091 \$2.3906

\$1.0600 \$1.0600 \$2.4520

Sewage

\$2.2213 \$2.2213 \$3.8762

\$1.9690 \$1.9690 \$3.6103

Re

\$5.0190 \$5.0190 \$5.3227

\$5.4243 \$5.4243 \$8.9456

**GVEA Utility Rates
And Utility Bills
For Ft. Wainwright**

RECEIVED 6/21/94

GVEA Electric Rate Schedules

These rates have been in effect since October 1982.

Residential	Customer Charge	\$10.00
	Energy Charge	
	First 500 kwh	\$.1125/kwh
	Over 500 kwh	.095/kwh

GS-1 (General Service-1)	Customer Charge	\$20.00
	Energy Charge	
	First 500 kwh	\$.150/kwh
	Next 4,500 kwh	.111/kwh
	Over 5,000 kwh	.095/kwh

→ GS-2 (General Service-2)	Customer Charge	\$40.00
	Demand Charge	
	All kw	\$ 6.25/kw

Energy Charge	First 500 kwh	\$.1136/kwh
	Next 4,500 kwh	.099/kwh
	Next 10,000 kwh	.0934/kwh
	Over 15,000 kwh	.0758/kwh

Effective Rates

(Includes fuel adjustment reduction.)

\$.09279/kwh
\$.07529/kwh

\$.13029/kwh
\$.09129/kwh
\$.07529/kwh

\$.09389/kwh
\$.07929/kwh
\$.07369/kwh
\$.05609/kwh

How to Calculate Your Monthly Bill

This example shows how the total due was calculated for a sample residential bill for 874 kilowatt-hours.

Monthly customer charge	\$10.00
First 500 kwh x \$0.1125	56.25
Remaining 374 kwh x \$0.095	<u>35.53</u>
	\$101.78
Less fuel adjustment	
874 kwh x \$.01971*	(\$17.23)
Regulatory Cost Charge	
874 kwh x \$.000386**	<u>.34</u>
TOTAL DUE	\$84.89

*CPA effective 6/7/94 (calculated quarterly)

**RCC effective 10/1/93



**Golden Valley
Electric Association**

"Owned By Those We Serve."

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

DATE OCTOBER 12, 1993

SOLD TO: Directorate of Contracting
 ATTN: Steve Russell
 P.O. Box 5-525
 Ft. Richardson, Alaska
 99505-0525

ACCOUNT NO: 171-0004-00

REGARDING Fort Wainwright in From GVEA

BILLING PERIOD ~~SEPTEMBER 15 - 31, 1993~~

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	80260	80223		37			370			
DEMAND					28			280			

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 5,400 KW
 JANUARY 1993

\$16,862.62

LESS PREVIOUS BILLING SEPTEMBER 1 - 15, 1993 MINIMUM DUE

THIS INVOICE IS DUE AND PAYABLE 30 DAYS FROM ABOVE DATE

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$16,862.62

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$67,506.23

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$101,271.46

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
 THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

By *Benjamin E. Watkinson*

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE OCTOBER 12, 1993

ACCOUNT NO: 171-0004-00

REGARDING Fort Wainwright In From GVEA

BILLING PERIOD SEPTEMBER 1, 1993 TO SEPTEMBER 30, 1993

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	60260	60223		37			370			
DEMAND					28			280			

CUSTOMER CHARGE

370 KWH @ 0.1136 42.03
0 KWH @ 0.0990 0.00
0 KWH @ 0.0934 0.00
0 KWH @ 0.0756 0.00

TOTAL KILOWATT HOUR CHARGES

40.00

\$42.03

DEMAND CHARGE

1,750.00

COST OF POWER ADJUSTMENT 0.02027 PER KWH

(7.50)

REGULATORY CHARGE .000626 PER/KWH

0.23

LATE CHARGES

15.00

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 5,400 KW

16,882.62

THIS INVOICE DUE AND PAYABLE 30 DAYS FROM ABOVE DATE

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$16,882.62

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$67,506.23

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$84,388.85

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Barbara E. Whitebury*

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249
FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE NOVEMBER 11, 1993

ACCOUNT NO: 171-0004-00

REGARDING Fort Weinwright In From GVEA

BILLING PERIOD OCTOBER 1 - 15, 1993

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	80260	80260			0		0			
DEMAND						0		0			

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 5,400 KW
JANUARY 1993

\$16,882.50

LESS PREVIOUS BILLING OCTOBER 1 - 15, 1993 MINIMUM DUE

THIS INVOICE DUE AND PAYABLE 20 DAYS FROM ABOVE DATE

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$16,882.50

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$101,271.46

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$135,036.46

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Benita Eubank*

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249
FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE NOVEMBER 11, 1993

ACCOUNT NO: 171-0004-00

REGARDING Fort Wainwright In From GVEA

BILLING PERIOD OCTOBER 1 - 15, 1993

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC CONS	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	80260	80260		0			0			
DEMAND					0			0			

CUSTOMER CHARGE 40.00

0 KWH @	0.1136	0.00
0 KWH @	0.0990	0.00
0 KWH @	0.0934	0.00
0 KWH @	0.0758	0.00

TOTAL KILOWATT HOUR CHARGES \$0.00

DEMAND CHARGE 0.00

COST OF POWER ADJUSTMENT 0.02027 PER KWH 0.00

REGULATORY CHARGE .000386 PER/KWH 0.00

LATE CHARGES 15.00

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 5,400 KW 16,862.50

THIS INVOICE DUE AND PAYABLE 30 DAYS FROM ABOVE DATE

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$16,862.50

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$101,271.46

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$118,153.96

(See contract for penalty information)

CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Debbie E. Lathbury*

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

750 ILLINOIS STREET - BOX 71240
FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE DECEMBER 7, 1993

ACCOUNT NO: 171-0004-00

REGARDING Fort Weinwright in From GVEA

BILLING PERIOD ~~NOVEMBER 20-30, 1993~~ **Revised December 21, 1993** ~~PAGE 1~~

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	134257	80260		53997			639970			
DEMAND					276			2760			

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 5,400 KW
JANUARY 1993

\$18,057.42

LESS PREVIOUS BILLING NOVEMBER 1 - 15, 1993 MINIMUM DUE

THIS INVOICE DUE AND PAYABLE 20 DAYS FROM ABOVE DATE

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

PAGE 1 \$18,057.42

PAGE 2 \$18,057.42

NET TOTAL \$18,057.42

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$50,623.96

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$104,796.22

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Steve Russell*

FAIRBANKS, ALASKA

B-9

FAIRBANKS, ALASKA

ACCOUNT NO: 171-0004-00

Revised December 21, 1993

BILLING PERIOD NOVEMBER 1 - 15, 1999 PAGE 1

THIS INVOICE DUE AND PAYABLE 20 DAYS FROM ABOVE DATE

NET AMOUNT DUE \$68,681.38

BY James W. H. H. H. H.

E-10

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE JANUARY 7, 1994

ACCOUNT NO: 171-0004-00

REGARDING Fort Wainwright In From GVEA

BILLING PERIOD DECEMBER 20 - 31, 1993 PAGE 3

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	175557	134257		41300			413000			
DEMAND					TRUE CALC. CONS	DEMAND TOTAL					

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 5,400 KW
JANUARY 1993

\$19,195.28

LESS PREVIOUS BILLING DECEMBER 1 - 15, 1993 MINIMUM DUE

THIS INVOICE DUE AND PAYABLE 30 DAYS FROM ABOVE DATE

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

PAGE 1 \$19,195.28

PAGE 2 \$19,195.28

NET TOTAL \$19,195.28

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$70,554.90

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$128,240.82

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Steve Russell*

B-11

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE JANUARY 7, 1994

ACCOUNT NO: 171-0004-00

REGARDING Fort Wainwright in From GVEA

BILLING PERIOD DECEMBER 10 - 20, 1993 PAGE 2

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	175557	134257		41300			413000			
DEMAND					268			2680			

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 5,400 KW
JANUARY 1993

\$19,195.26

LESS PREVIOUS BILLING DECEMBER 1 - 10, 1993 MINIMUM DUE

THIS INVOICE DUE AND PAYABLE 20 DAYS FROM ABOVE DATE

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

PAGE 1 \$19,195.26
NET TOTAL \$19,195.26

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$70,654.90

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$109,045.54

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Bentley W. Watkinson*

B-12

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE JANUARY 7, 1994

ACCOUNT NO: 171-0004-00

REGARDING Fort Wainwright In From GVEA

BILLING PERIOD DECEMBER 1 - 10, 1993 PAGE 1

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	175557	134257		41300			413000			
DEMAND					268			2680			

CUSTOMER CHARGE 40.00

500 KWH @	0.1136	56.80
4500 KWH @	0.0990	445.50
10000 KWH @	0.0934	934.00
398000 KWH @	0.0758	30168.40

TOTAL KILOWATT HOUR CHARGES \$31,604.70

DEMAND CHARGE 33,750.00

COST OF POWER ADJUSTMENT 0.01933 PER KWH (7,983.29)

REGULATORY CHARGE .000366 PER/KWH 159.42

LATE CHARGES 15.00

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 5,400 KW 19,195.28

THIS INVOICE DUE AND PAYABLE 30 DAYS FROM ABOVE DATE

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$19,195.28

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$70,654.99

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$89,850.27

(See contract for penalty information)

CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Brent Watkinson*

E-13

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249
FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE FEBRUARY 2, 1994

ACCOUNT NO: 171-0004-00

REGARDING Fort Wainwright In From GVEA

BILLING PERIOD ~~JANUARY 20 - 31, 1994~~ ~~PAGE 2 OF 2~~

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	183422	175557		7865			78650	KWH		
DEMAND					TRUE CALC. CONS	DEMAND TOTAL					

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 5,400 KW
JANUARY 1993

\$11,358.67

LESS PREVIOUS BILLING DECEMBER 1 - 15, 1993 MINIMUM DUE

THIS INVOICE DUE AND PAYABLE 30 DAYS FROM ABOVE DATE

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

PAGE 1 \$11,358.67
PAGE 2 \$11,358.67
NET TOTAL \$11,358.67

PENALTY TOTAL \$

ADD TAX

34,076.01

ADD TAX \$

ARREARS \$121,137.61

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$155,213.63

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Benjamin E. Whiteburg*

B-14

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

750 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE FEBRUARY 2, 1994

ACCOUNT NO: 171-0004-00

REGARDING Fort Weinwright in From GVEA

BILLING PERIOD JANUARY 10-20, 1994 PAGE 2

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	183422	175557		7865			78650			
DEMAND					380			3800			

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 5,400 KW
JANUARY 1993

\$11,358.67

LESS PREVIOUS BILLING DECEMBER 1 - 10, 1993 MINIMUM DUE

THIS INVOICE DUE AND PAYABLE 30 DAYS FROM ABOVE DATE

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

PAGE 1 \$11,358.67
NET TOTAL \$11,358.67

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$121,137.81

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$143,854.96

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Steve E. Winkler*

B-13

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE FEBRUARY 2, 1994

ACCOUNT NO: 171-0004-00

REGARDING Fort Wainwright In From GVEA

BILLING PERIOD JANUARY 1-10, 1994 PAGE 1787

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	183422	175557		7865			78650			
DEMAND					360			3600			

CUSTOMER CHARGE

40.00

500 KWH @	0.1136	56.80
4500 KWH @	0.0990	445.50
10000 KWH @	0.0934	934.00
63650 KWH @	0.0758	4824.67

TOTAL KILOWATT HOUR CHARGES

\$6,260.97

DEMAND CHARGE

29,250.00

COST OF POWER ADJUSTMENT 0.01933 PER KWH

(1,520.30)

REGULATORY CHARGE .000386 PER/KWH

30.36

LATE CHARGES

15.00

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 4,060 KW

11,358.67

THIS INVOICE DUE AND PAYABLE 30 DAYS FROM ABOVE DATE

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$11,358.67

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$121,137.61

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$132,496.28

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Steve E. Wainwright*

B-16

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249
FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE MARCH 8, 1994

ACCOUNT NO: 171-0004-00

REGARDING Fort Belknap in Front GVEA

BILLING PERIOD FEBRUARY 1994

METER NO.	MULT.	PREV. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEMAND READ	TRUE CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	183443	183422		21			210			
DEMAND					16			160			

CUSTOMER CHARGE											40.00
210 KWH @		0.1136		23.86							
0 KWH @		0.0990		0.00							
0 KWH @		0.0934		0.00							
0 KWH @		0.0758		0.00							
TOTAL KILOWATT HOUR CHARGES											\$23.86
DEMAND CHARGE											16,926.00
COST OF POWER ADJUSTMENT	0.01933 PER KWH										(4.06)
REGULATORY CHARGE .000386 PER/KWH											0.06
LATE CHARGES											15.00

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 3,640 KW 22,766.06

THIS INVOICE DUE AND PAYABLE 20 DAYS FROM ABOVE DATE

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$22,766.06

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$120,310.15

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$143,075.23

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.
BY _____

B-17

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE APRIL 6, 1994

ACCOUNT NO: 171-0004-00

REGARDING Fort Wainwright In From GVEA

BILLING PERIOD MARCH 1994

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	183531	183443		88			880			
DEMAND					0			0			

CUSTOMER CHARGE 40.00

500 KWH @	0.1136	56.80
380 KWH @	0.0990	37.62
0 KWH @	0.0934	0.00
0 KWH @	0.0756	0.00

TOTAL KILOWATT HOUR CHARGES 894.42

DEMAND CHARGE 15,925.00

COST OF POWER ADJUSTMENT 0.0185 PER KWH (16.28)

REGULATORY CHARGE .000366 PER/KWH 0.34

LATE CHARGES 15.00

TOTAL BILL DEMAND MINIMUM \$5.25 TIMES 3,640 KW 22,765.34

THIS INVOICE DUE AND PAYABLE 20 DAYS FROM ABOVE DATE

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$22,765.34

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$62,779.67

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$85,545.21

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Beet Watschewsky*

B-18

FT. WAINWRIGHT 1994

APRIL

BILLING PERIOD	4-31	VOUCHER NUMBER	25197
BILL AMOUNT	22,750.00	PAYMENT DATE	5/2/94
REVISED BILL AMOUNT		PAYMENT AMOUNT	22,750.00
LATE PAYMENT FEE	150	AMOUNT OWING	0
INTEREST			

MAY

BILLING PERIOD	5-31	VOUCHER NUMBER	
BILL AMOUNT	22,750.59	PAYMENT DATE	7/25
REVISED BILL AMOUNT		PAYMENT AMOUNT	22,750.59
LATE PAYMENT FEE	150	AMOUNT OWING	22,750.59
INTEREST			

JUNE

BILLING PERIOD	June 94	VOUCHER NUMBER	
BILL AMOUNT	48,713.19	PAYMENT DATE	
REVISED BILL AMOUNT		PAYMENT AMOUNT	
LATE PAYMENT FEE	150	AMOUNT OWING	
INTEREST			

08-19

48,713.19

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE JUNE 8, 1994

ACCOUNT NO: 171-0004-00

REGARDING Fort Wainwright in From GVEA

BILLING PERIOD MAY 1994

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRUE CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	183701	183548		153			1530			
DEMAND					84			840			

CUSTOMER CHARGE					40.00
500 KWH @	0.1136	56.80			
1030 KWH @	0.0990	101.97			
0 KWH @	0.0934	0.00			
0 KWH @	0.0758	0.00			
TOTAL KILOWATT HOUR CHARGES					\$158.77
DEMAND CHARGE					15,925.00
COST OF POWER ADJUSTMENT 0.0185 PER KWH					(28.31)
REGULATORY CHARGE .000386 PER/KWH					0.59
LATE CHARGES					15.00
TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 3,640 KW					22,785.59

THIS INVOICE DUE AND PAYABLE 20 DAYS FROM ABOVE DATE

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$22,785.59

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$81,959.36

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$84,724.95

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

By: [Signature]

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

756 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

LD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE JULY 8, 1994

ACCOUNT NO: 171-0004-00

DAHC76-94-C-0009

REGARDING Fort Wainwright in From GVEA

BILLING PERIOD ~~XXXXXX~~ JUNE 94

CONTRACT NUMBER: DAHC76-92-C-0000

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70107	10	190614	183701		6913			69130			
DEMAND					712			7120			

CUSTOMER CHARGE

500 KWH @	0.1136	56.80
4500 KWH @	0.0990	445.50
10000 KWH @	0.0934	934.00
54130 KWH @	0.0758	4103.05

40.00

TOTAL KILOWATT HOUR CHARGES

\$5,539.35

DEMAND CHARGE

COST OF POWER ADJUSTMENT 0.01071 PER KWH

44,500.00

REGULATORY CHARGE .000386 PER/KWH

(1,362.55)

LATE CHARGES

26.68

15.00

TOTAL BILL DEMAND MINIMUM \$6.25 TIMES 3,640 KW

48,758.49

THIS INVOICE DUE AND PAYABLE 30 DAYS FROM ABOVE DATE

BILL AND DEMAND TOTAL

SERVICES RECEIVED AND ACCEPTED ** \$48,758 49

PURCHASED ELECTRICITY
2142020 82-1300 117096J
2333 MODUTIL 506N540
ANFA S95523

SURCHARGE OR DISCOUNT

CONNECTING CHARGE DETAIL

Patrick G. Driscoll
PATRICK G. DRISCOLL, P.E.
CH, UTILITIES, DFW, FWA

NET TOTAL

\$48,758.49

PENALTY TOTAL

ADD TAX

ADD TAX

ARREARS

\$22,312.04

PENALTY AMOUNT DUE

NET AMOUNT DUE

\$71,070.53

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY *Quart*

FILE COPY

FIRST AUTHORIZATION FOR
PAYMENT MADE BY FT WAINWRIGHT
20 SEP 94

6 21

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71240

FAIRBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE August 4, 1994

ACCOUNT NO: 171-0004-00

REVISED

DAHC76-94-C-0009

REGARDING Fort Wainwright in From GVEA

BILLING PERIOD ~~JULY 1994~~

CONTRACT NUMBER: DAHC76-92-C-0009

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70197	10	193633	190614		3019			30190			
DEMAND					244			2440			

CUSTOMER CHARGE

40.00

500 KWH @	0.1136	56.80
4500 KWH @	0.0990	445.50
10000 KWH @	0.0934	934.00
15190 KWH @	0.0758	1151.40

TOTAL KILOWATT HOUR CHARGES

\$2,587.70

DEMAND CHARGE

\$1,150.00

COST OF POWER ADJUSTMENT 0.01071 PER KWH

(\$95.04)

REGULATORY CHARGE .000386 PER/KWH

11.65

LATE CHARGES

15.00

TOTAL BILL MINIMUM \$6.25 TIMES 7,120 KW

44,526.65

THIS INVOICE DUE AND PAYABLE 30 DAYS FROM ABOVE DATE

BILL AND DEMAND TOTAL SERVICES RECEIVED AND ACCEPTED ** \$44,526.65

PURCHASED ELECTRICITY
2142020 82-1300 117096J
2333 MODUTIL507N540
ANFA S95523

SURCHARGE OR DISCOUNT

\$

CONNECTING CHARGE DETAIL

Patrick J. Driscoll
PATRICK J. DRISCOLL, P.E.
CH, UTILITIES, DPW, FWA

NET TOTAL

\$44,526.65

PENALTY TOTAL

\$

ADD TAX

ADD TAX

\$

ARREARS

\$46,304.94

PENALTY AMOUNT DUE

\$

NET AMOUNT DUE

\$92,831.59

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY _____

FILE COPY

6-22

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

750 ILLINOIS STREET - BOX 71240

FARMBANKS, ALASKA

SOLD TO: Directorate of Contracting
ATTN: Steve Russell
P.O. Box 5-525
Ft. Richardson, Alaska
99505-0525

DATE September 1, 1994

ACCOUNT NO: 171-0004-00

ACTUAL

DAHC76-94-C-0009

REGARDING Fort Weinwright In From GVEA

BILLING PERIOD AUGUST 1994

CONTRACT NUMBER: DAHC76-94-C-0009

METER NO.	MULT.	PREV. READ	PREV. READ	BASE CONS.	TRUE CALC CONS	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70187	10	196253	193833		2620			26200			
DEMAND					428			4280			

CUSTOMER CHARGE

500 KWH @	0.1136	56.80	40.00
4500 KWH @	0.0990	445.50	
10000 KWH @	0.0934	934.00	
11200 KWH @	0.0758	848.96	

TOTAL KILOWATT HOUR CHARGES

82,265.26

DEMAND CHARGE

COST OF POWER ADJUSTMENT 0.01071 PER KWH 81,160.00

REGULATORY CHARGE .000366 PER/KWH (516.40)

LATE CHARGES 10.11

15.00

TOTAL BILL MINIMUM \$6.25 TIMES 7,180 KW

44,525.11

THIS INVOICE DUE AND PAYABLE 28 DAYS FROM ABOVE DATE

BILL AND DEMAND TOTAL

SERVICES RECEIVED AND ACCEPTED ** \$44,525.11

PURCHASED ELECTRICITY

2142020 82-1300 117096J

2333 MODUTIL508N540

ANFA 595523

SURCHARGE OR DISCOUNT

CONNECTING CHARGE DETAIL

Patrick E. Driscoll
PATRICK E. DRISCOLL, P.E.
CH, UTILITIES, DPW, FWA

NET TOTAL \$44,525.11

PENALTY TOTAL

ADD TAX

ADD TAX

ARREARS \$92,831.50

PENALTY AMOUNT DUE

NET AMOUNT DUE \$137,366.70

(See schedule for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

FILE COPY

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY

**GVEA Utility Bills for
Ft. Greely**

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

756 ILLINOIS STREET -- BOX 71249

FAIRBANKS, ALASKA

SOLD TO: Facilities Engineers
Utilities Engineers
P.O. Box 3016
Ft. Greely AK 99703

DATE OCTOBER 7, 1993

ACCOUNT NO: 010-4410-00

REGARDING Ft. Greely in from GVEA

BILLING PERIOD SEPTEMBER 1993

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
7175	2400	7000.7	7380.1		830.6			1,249,440			
					(1.01)			2,424			
70197	10	671,963	730,632		141,131			1,411,310			
FWO - 11.1% = WE								1,254,955			
FORT GREELY KWH RECEIVED								1,249,440			
FORT WAINWRIGHT ADJUSTED OUTPUT								1,254,955			
PURCHASED ELECTRICITY								(5,215)			
POWER PURCHASE COSTS											
CUSTOMER CHARGE								40.00			
0 KWH @ 0.1136								0.00			
0 KWH @ 0.0990								0.00			
0 KWH @ 0.0934								0.00			
0 KWH @ 0.0758								0.00			
COST OF POWER ADJUSTMENT 0.02027 PER/KWH								0.00			
POWER WHEELED								16,828.63			
DEMAND 2424 KW @ \$6.25								15,150.00			
LATE CHARGE								15.00			
REGULATORY CHARGES @ 0.000026 CENTS/KWH								0.00			
TOTAL BILL								\$32,033.93			

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$32,033.93

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS

PENALTY AMOUNT DUE \$

NET AMOUNT DUE

\$66,872.94

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.
BY _____

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71248

FAIRBANKS, ALASKA

OLD TO: Facilities Engineers
Utilities Engineers
P.O. Box 3016
Ft. Greely AK 99703

DATE OCTOBER 7, 1993

ACCOUNT NO: 010-4410-00

REGARDING Ft. Greely In from GVEA

BILLING PERIOD OCTOBERS 1993

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS	DEM. READ	TRUE CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	NET TOTAL	TAX TOTAL
7175	2400	8491.7	7909.7		582			1,396,800			
	DEMAND				1.14			2,736			
70197	10	1,021,299	871,993		149,326			1,493,299			
PWO - 11.1% = WE		165,752						1,327,508			
FORT GREELY KWH RECEIVED								1,396,800			
FORT WAINWRIGHT ADJUSTED OUTPUT								1,327,508			
PURCHASED ELECTRICITY								66,292			
POWER PURCHASE COSTS								40.00			
CUSTOMER CHARGE								56.80			
500 KWH @			0.1136					56.80			
4500 KWH @			0.0990					445.50			
10,000 KWH @			0.0934					934.00			
64,292 KWH @			0.0758					4,115.32			
ST OF POWER ADJUSTMENT			0.02027 PER/KWH					(1,404.55)			
POWER WHEELED								17,893.07			
DEMAND	2736 KW @ \$6.25							17,100.00			
LATE CHARGE								15.00			
REGULATORY CHARGES @	0.000366 CENTS/KWH							28.75			
TOTAL BILL								89,131.89			

\$ 1430

5551.62

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL 89,131.89

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS 898,906.57

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$138,038.76

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY _____

B-26

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

756 ILLINOIS STREET - BOX 71248

FAIRBANKS, ALASKA

TO: Facilities Engineers
Utilities Engineers
P.O. Box 3016
Ft. Greely AK 99703

DATE DECEMBER 7, 1993

ACCOUNT NO: 010-4410-00

REGARDING Ft. Greely in from GVEA

BILLING PERIOD NOVEMBER 1993

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
7175	2400	9129.9	8491.7		636.2			1,531.880			
	DEMAND				1.21			2.804			
70197	10	138,127	21,200		116,638			1,166.980			
FWO - 11.1% = WE		129,860						1,036.890			
FORT GREELY KWH RECEIVED								1,531.880			
FORT WAINWRIGHT ADJUSTED OUTPUT								1,036.890			
PURCHASED ELECTRICITY								482.990			
POWER PURCHASE COSTS											
CUSTOMER CHARGE								40.00			
	500 KWH @		0.1136					56.80			
	4500 KWH @		0.0090					445.50			
	10,000 KWH @		0.0034					934.00			
	477,990 KWH @		0.0758					36,231.66			
ST OF POWER ADJUSTMENT			0.02027 PER/KWH					(9,982.81)			
POWER WHEELED								13,941.24			
DEMAND		2904 KW @ \$6.25						18,160.00			
LATE CHARGE								15.00			
REGULATORY CHARGES @		0.000386 CENTS/KWH						190.29			
TOTAL BILL								60,011.58			

37667

BILL AND DEMAND TOTAL \$
SURCHARGE OR DISCOUNT \$
CONNECTING CHARGE DETAIL \$

NET TOTAL \$60,011.58

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS

\$39,131.89

PENALTY AMOUNT DUE \$

NET AMOUNT DUE

\$99,143.47

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY _____

8-27

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

756 ILLINOIS STREET - BOX 71248

FAIRBANKS, ALASKA

TO: Facilities Engineers
Utilities Engineers
P.O. Box 3016
Ft. Greely AK 99703

DATE JANUARY 7, 1994

ACCOUNT NO: 010-4410-00

REGARDING Ft. Greely In from GVEA

BILLING PERIOD DECEMBER 1993

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	NET TOTAL	TAX TOTAL
7175	2400	9793.1	9129.9		983.2			1,591,680			
	DEMAND				1.21			2,904			
70197	10	252,064	136,127		114,527			1,145,270			
FWO - 11.1% = WE								1,018,145			
PORT GREELY KWH RECEIVED								1,591,680			
PORT WAINWRIGHT ADJUSTED OUTPUT								1,018,145			
PURCHASED ELECTRICITY								673,535			
POWER PURCHASE COSTS											
CUSTOMER CHARGE								40.00			
500 KWH @								55.00			
4500 KWH @								445.50			
10,000 KWH @								934.00			
556,535 KWH @								42,336.95			
RT OF POWER ADJUSTMENT								(11,086.43)			
POWER WHEELED								13,666.54			
DEMAND 2904 KW @ \$5.25								15,150.00			
LATE CHARGE								0.00			
REGULATORY CHARGES @ 0.000386 CENTS/KWH								221.36			
TOTAL BILL								64,764.74			

43773

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL 64,764.74

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$0.00

PENALTY AMOUNT DUE \$

NET AMOUNT DUE 64,764.74

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.
BY _____

6-28

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

756 ILLINOIS STREET - BOX 71240

FAIRBANKS, ALASKA

1101

OLD TO: Facilities Engineers
Utilities Engineers
P.O. Box 3016
Ft. Greely AK 99703

DATE FEBRUARY 2, 1994

ACCOUNT NO: 010-4410-00

REGARDING Ft. Greely In from GVEA

BILLING PERIOD JANUARY 1994

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRUE CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	NET TOTAL	TAX TOTAL
7175	2400	10444.7	8793.1		651.8			1,583,840			
DEMAND								1.94	2,976		
70107	10	437,024	282,864		184,370			1,843,700			
FWO - 11.1% = WE								204,861	1,838,049		
PORT GREELY KWH RECEIVED									1,583,840		1.0
PORT WAINWRIGHT ADJUSTED OUTPUT									1,838,049		1.0
PURCHASED ELECTRICITY								(75,300)			1
POWER PURCHASE COSTS											
CUSTOMER CHARGE									40.00		
0 KWH @ 0.1136									0.00		
0 KWH @ 0.0000									0.00		
0 KWH @ 0.0034									0.00		
0 KWH @ 0.0758									0.00		
DST OF POWER ADJUSTMENT 0.01633 PER/KWH									0.00		
POWER WHEELED									21,988.72		
DEMAND 2976 KW @ \$6.25									18,600.00		
LATE CHARGE									15.00		
REGULATORY CHARGES @ 0.000366 CENTS/KWH									0.00		
TOTAL BILL									40,623.72		
THIS INVOICE DUE AND PAYABLE 15 DAYS FROM ABOVE DATE											

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$40,623.72

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$64,764.74

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$105,388.46

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

BY _____

B-27

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249
FAIRBANKS, ALASKA

JLD TO: Facilities Engineers
Utilities Engineers
P.O. Box 3018
Ft Greely AK 99703

DATE MARCH 8, 1994

ACCOUNT NO: 010-4410-00

REGARDING Ft Greely in from GVEA

BILLING PERIOD FEBRUARY 1994

METER NO.	MULT.	PREL. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
7175	2400	1063	444.7		618.3			1,483.920			
	DEMAND				1.21			2,904			
70197	10	579,840	457,024		142,825			1,428,250			
FWO - 11.1% = WE								1,265,200			
FORT GREELY KWH RECEIVED								1,483,920			
FORT WAINWRIGHT ADJUSTED OUTPUT								1,265,200			
PURCHASED ELECTRICITY								218,651			
POWER PURCHASE COSTS								40.00			
CUSTOMER CHARGE								56.90			
500 KWH @ 0.1136								445.50			
4500 KWH @ 0.0990								934.00			
10,000 KWH @ 0.0934								15,436.73			
203,651 KWH @ 0.0756								(4,226.52)			
1ST OF POWER ADJUSTMENT 0.01933 PER/KWH								16,970.86			
POWER WHEELED								16,150.00			
DEMAND 2904 KW @ \$6.25								0.00			
LATE CHARGE								84.40			
REGULATORY CHARGES @ 0.000366 CENTS/KWH											
TOTAL BILL								47,891.77			

10873

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$47,891.77

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS

\$0.00

PENALTY AMOUNT DUE \$

NET AMOUNT DUE

\$47,891.77

(See annex for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.
BY _____

6-30

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

756 ILLINOIS STREET - BOX 71249
FAIRBANKS, ALASKA

SOLD TO: Facilities Engineers
Utilities Engineers
P.O. Box 3016
Ft. Greely AK 99703

DATE APRIL 6, 1994

ACCOUNT NO: 010-4410-00

REGARDING Ft. Greely In from GVEA

BILLING PERIOD MARCH 1994

METER NO.	MULT.	PREV. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRUE CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
7175	2400	1522	1063		459			1,101,800			
70076	2400	196	0 meter change		196			470,400			
DEMAND											
70197	10	711,825	579,349		132,276			1,822,790			
FWO - 11.1% = WE									1,175,934		
FORT GREELY KWH RECEIVED									1,572,000		
FORT WAINWRIGHT ADJUSTED OUTPUT									1,175,934		
PURCHASED ELECTRICITY									396,066		
POWER PURCHASE COSTS											
CUSTOMER CHARGE									40.00		
500 KWH @ 0.1136									56.80		
4500 KWH @ 0.0090									445.50		
10,000 KWH @ 0.0034									934.00		
361,066 KWH @ 0.0756									26,864.83		
COST OF POWER ADJUSTMENT 0.0185 PER/KWH									(7,327.23)		
POWER WHEELED									16,776.35		
DEMAND 2784 KW @ \$6.25									17,400.00		
LATE CHARGE									0.00		
REGULATORY CHARGES @ 0.000366 CENTS/KWH									162.86		
TOTAL BILL									56,363.13		

30320

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$56,363.13

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$0.00

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$56,363.13

(See contract for penalty information)

CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY _____

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

756 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

OLD TO: Facilities Engineers
Utilities Engineers
P.O. Box 3016
Ft Greely AK 99703

DATE MAY 4, 1994

ACCOUNT NO: 010-4410-00

REGARDING Ft. Greely in from GVEA

SELLING PERIOD APRIL 1994

METER NO.	MULT.	PRES. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70876	2400	765	196		560			1,365,600			
	DEMAND				1.12			2,668			
70187	10	831,784	711,625		120,156		1,201,590				
							43,865	1,157,735			
FWO > 120% OF FT. GREELY DEMAND									1,029,226		
FWO - 11.1% = WE								128,509			
FORT GREELY KWH RECEIVED									1,365,600		
FORT WAINWRIGHT ADJUSTED OUTPUT									1,029,226		
PURCHASED ELECTRICITY									336,374		
POWER PURCHASE COSTS											
CUSTOMER CHARGE								40.00			
500 KWH @								0.1136	56.80		
4500 KWH @								0.0090	445.80		
10,000 KWH @								0.0034	994.00		
321,374 KWH @								0.0758	24,360.12		
COST OF POWER ADJUSTMENT								0.01833 PER/KWH	(6,502.10)		
POWER WHEELED									13,814.71		
DEMAND								2668 KW @ \$6.25	16,800.00		
LATE CHARGE									15.00		
REGULATORY CHARGES @								0.000366 CENTS/KWH	129.84		
TOTAL BILL									60,093.86		

25,796

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$50,093.86

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$56,362.63

PENALTY AMOUNT DUE \$

NET AMOUNT DUE \$106,456.69

(See comment for penalty information)

CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY _____

B-32

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

756 ILLINOIS STREET - BOX 71249
FAIRBANKS, ALASKA

SOLD TO: Facilities Engineers
Utilities Engineers
P.O. Box 3016
Ft Greely AK 99703

DATE JUNE 8, 1994

ACCOUNT NO: 010-4410-00

REGARDING Ft Greely in from GVEA

BILLING PERIOD MAY 1994

METER NO.	MULT.	PREL. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRUE CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70076	2400	1271 ✓	765 ✓		506 ✓			1,214,400 ✓			
	DEMAND					1.06		2,544 ✓			
70197	10	964,964 ✓	831,764 ✓		182,600 ✓		1,326,000 ✓				
FWO > 120% OF FT. GREELY DEMAND								63,188	1,272,847 ✓		
FWO - 11.1% = WE								141,286 ✓	1,131,561 ✓		
FORT GREELY KWH RECEIVED									1,214,400 ✓		
FORT WAINWRIGHT ADJUSTED OUTPUT									1,131,561 ✓		
PURCHASED ELECTRICITY									62,830 ✓		
POWER PURCHASE COSTS											
CUSTOMER CHARGE									40.00 ✓		
500 KWH @ 0.1136									56.80 ✓		
4500 KWH @ 0.0900									445.80 ✓		
10,000 KWH @ 0.0934									934.00 ✓		
67,830 KWH @ 0.0756									5,142.20 ✓		
COST OF POWER ADJUSTMENT 0.01633 PER/KWH									(1,601.28) ✓		
POWER WHEELED									15,189.03 ✓		
DEMAND 2544 KW @ \$6.25									15,900.00 ✓		
LATE CHARGE									15.00 ✓		
REGULATORY CHARGES @ 0.000366 CENTS/KWH									31.96 ✓		
TOTAL BILL									36,147.23 ✓		

6578

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$36,147.23

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS \$50,093.57

TOTAL AMOUNT DUE \$

NET AMOUNT DUE \$86,240.60

(amount for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY _____

B-33

FAIRBANKS, ALASKA

ACCOUNT NO: 810-4410-00

REGARDING FL Greety In from GVEA

BILLING PERIOD JUNE 1964

CONTRACT NUMBER: DAHC76-82-C-0009

NET AMOUNT DUE **\$127,569.00**

(See comment for possibly information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND

PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY _____

634

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

758 ILLINOIS STREET - BOX 71249

FAIRBANKS, ALASKA

ADD TO: DIRECTORATE OF PUBLIC WORKS
1000 GAFFNEY BLVD. #6500
ATTN: APVR - FW - PW - 0
POWER PLANT
FT. WAINWRIGHT, AK 99703-6500

DATE August 4, 1994

ACCOUNT NO: 010-4410-00

REGARDING Ft. Greely in from GVEA

BILLING PERIOD JULY 1994

CONTRACT NUMBER: DAHC78-92-C-0000

METER NO.	MULT.	PREL. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALG. DEMAND	DEMAND TOTAL	BILL TOTAL	STRT TOTAL	TAX TOTAL
70976	3400	2191 ✓	1796 ✓		466			1,092,000			
DEMAND								2,184			
70197	10	150,832 ✓	62,800 ✓		96,763		967,630				
FWO > 120% OF FT. GREELY DEMAND								81,268 ✓	936,262		
FWO - 11.1% = WE									932,837		
FORT GREELY KWH RECEIVED									1,092,000		
FORT WAINWRIGHT ADJUSTED OUTPUT									932,837		
PURCHASED ELECTRICITY									250,863		
POWER PURCHASE COSTS											
CUSTOMER CHARGE								40.00			
500 KWH @ 0.1198								59.90			
4500 KWH @ 0.0990								445.50			
10,000 KWH @ 0.0934								934.00			
244,863 KWH @ 0.0768								18,545.46			
JUST OF POWER ADJUSTMENT 0.0167 PER KWH								(5,117.96)			
POWER WHEELED								11,182.07			
DEMAND 2184 KW @ \$6.25								13,650.00			
LATE CHARGE								15.00			
REGULATORY CHARGES @ 0.000366 CENTS/KWH								100.23			
TOTAL BILL								80,851.11			

19,982

BILL AND DEMAND TOTAL	\$		NET TOTAL	\$80,851.11
SURCHARGE OR DISCOUNT	\$			
CONNECTING CHARGE DETAIL	\$			
PENALTY TOTAL	\$		ADD TAX	
ADD TAX	\$		ARREARS	\$50,093.57
PENALTY AMOUNT DUE	\$		NET AMOUNT DUE	\$80,944.68

(See contract for penalty information)

IFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY _____

13-35

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

756 ILLINOIS STREET - BOX 71248

FAIRBANKS, ALASKA

LD TO: Facilities Engineers
Utilities Engineers
P.O. Box 3016
Ft. Greely AK 99703

DATE September 1, 1994

ACCOUNT NO: 010-4410-00

ACTUAL

(overcharge)

REGARDING Ft. Greely in from GVEA

BILLING PERIOD AUGUST 1994

CONTRACT NUMBER: DAHC76-92-C-0008

METER NO.	MULT.	PREL. READ	PREV. READ	BASE CONS.	TRUE CALC. CONS.	DEM. READ	TRU CALC. DEMAND	DEMAND TOTAL	BILL TOTAL	SITE TOTAL	TAX TOTAL
70076	2400	2666	2191		475			1,140,000			
	DEMAND				0.95			2,280			
70187	10	284,751	159,632		125,119		1,251,190				
	FWO > 120% OF FT. GREELY DEMAND						68,863	1,182,327			
	FWO - 11.1% = WE	131,238						1,051,089			
	PORT GREELY KWH RECEIVED							1,140,000			
	PORT WAINWRIGHT ADJUSTED OUTPUT							1,051,089			
	PURCHASED ELECTRICITY							88,911			
	POWER PURCHASE COSTS										
	CUSTOMER CHARGE							40.00			
	500 KWH @		0.1136					56.80			
	4500 KWH @		0.0000					445.50			
	10,000 KWH @		0.0934					934.00			
	73,911 KWH @		0.0758					5,602.48			
	NET OF POWER ADJUSTMENT		0.01971 PER/KWH					(1,752.44)			
	POWER WHEELED							14,107.09			
	DEMAND	2280 KW @ \$6.25						14,250.00			
	LATE CHARGE							15.00			
	REGULATORY CHARGES @	0.000386 CENTS/KWH						84.82			
	TOTAL BILL							33,732.68			

THIS INVOICE DUE AND PAYABLE 30 DAYS FROM ABOVE DATE

BILL AND DEMAND TOTAL \$

SURCHARGE OR DISCOUNT \$

CONNECTING CHARGE DETAIL \$

NET TOTAL \$33,732.68

PENALTY TOTAL \$

ADD TAX

ADD TAX \$

ARREARS

\$69,944.67

PENALTY AMOUNT DUE \$

NET AMOUNT DUE

\$123,677.35

(See contract for penalty information)

I CERTIFY THAT THE ABOVE BILL IS CORRECT AND JUST AND
THAT PAYMENT THEREFOR HAS NOT BEEN RECEIVED

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.

BY _____

B-36

GVEA Utility Services Contract

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE J		PAGE OF PAGES 1 2									
2. AMENDMENT/MODIFICATION NO. P00002		3. EFFECTIVE DATE 06/01/94		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (if applicable) FWA ELEC REQ									
ED BY DIRECTORATE OF CONTRACTING P.O. BOX 5-525 (APVR-DOC) FORT RICHARDSON AK 99505-0525 Stephan Russell		CODE DOC		7. ADMINISTERED BY (if other than item 6)		CODE									
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) Vendor ID: 10005138 GOLDEN VALLEY ELECTRIC ASSOC PO BOX 71249 FAIRBANKS AK 997071249				(X)		9A. AMENDMENT OF SOLICITATION NO.									
				X		9B. DATED (SEE ITEM 11)									
						10A. MODIFICATION OF CONTRACT/ORDER NO. DAHC76-92-C-0009									
						10B. DATED (SEE ITEM 13) 11/15/91									
CODE 0MT83		FACILITY CODE													
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS															
<input type="checkbox"/> The above numbered solicitation is amended as set forth in item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.															
COUNTING AND APPROPRIATION DATA (if required)				Mod Obligated Amount US		\$0.00									
FUNDS CITED ON INDIVIDUAL 1034's															
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.															
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:5%; text-align: center;">(X)</td> <td>A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.</td> </tr> <tr> <td></td> <td>B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103 (b).</td> </tr> <tr> <td style="text-align: center;">X</td> <td>C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: "MUTUAL AGREEMENT"</td> </tr> <tr> <td></td> <td>D. OTHER (Specify type of modification and authority)</td> </tr> </table>								(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.		B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103 (b).	X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: "MUTUAL AGREEMENT"		D. OTHER (Specify type of modification and authority)
(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.														
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103 (b).														
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: "MUTUAL AGREEMENT"														
	D. OTHER (Specify type of modification and authority)														
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return <u>3</u> copies to the issuing office.															
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) FORT GREELY ELECTRICAL SERVICES a. The purpose of this modification is to incorporate electrical specifications, exhibit #3, for the Central power Plant located on Fort Wainwright, Alaska. b. Subject to contract terms and conditions of this contract, the Contractor shall supply and the Government will pay for electrical service															
Except as provided herein, all terms and conditions of the document referenced in item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.															
NAME AND TITLE OF SIGNER (Type or print) Michael P. Kelly, General Manager INTRACORPORATOR <i>(Signature of person authorized to sign)</i>				15A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Donald L. Hickey K02		15B. UNITED STATES OF AMERICA BY <i>(Signature of Contracting Officer)</i>									
		15C. DATE SIGNED 5-5-94				16C. DATE SIGNED 12 May 94									
NSN 7540-01-152-6070 PREVIOUS EDITION UNUSABLE															

SF 30 CONTINUATION SHEET

in accordance with the tariff rate schedule number GS-II, dated September 21, 1982.

c. The government shall provide a preliminary 30 day notice for scheduling of increased service requirements. This notice will state the duration of and the estimated amount of electrical power required for the period requested. The contractor shall respond within ten days after receipt of the notice informing the government if it can provide the requested increased services or not. The government shall confirm the requirement for increased demand/usage 5 days prior to the required date.

d. Invoices for the increased services shall be billed during the scheduled period and at the actual demand of kw and kwhrs used. Once the increased services are no longer required the previously established minimum billing will be used. If during the normal course of this contract, the government sets a higher demand than allowed by the minimum billings, for any reason, without prior scheduling as identified in paragraph c above, the contractor may submit invoices in accordance with existing tariff provisions which allow billing at the highest demand setting within a 15 minute period for the next twelve month period.

e. The contract amount is hereby increased by an estimated \$200,000.00 from \$792,522.00 to \$992,522.00.

f. Exhibit No. 1, Electrical Service Specifications, Ft. Greely, paragraph 5, is changed to read as follows: (114 volts to 126 volts nominal base).



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY GARRISON, ALASKA
FORT RICHARDSON, ALASKA

November 04, 1992



Directorate of Contracting

SUBJECT: DAHC76-92-C-0009

Mr. Robert Hansen
Golden Valley Electric Association, Inc
P.O. Box 71249
Fairbanks, Alaska 99707

RECEIVED
NOV 06 1992
GVEA - Admin. Services

Dear Mr. Hansen:

Enclosed is a fully executed original of the subject contract. Please note that this contract requires modification in the following areas:

a) The Scope of Work needs to be expanded to allow for emergency purchase of electricity for Fort Wainwright, or this requirement can be included in a "service area wide" contract.

b) Revision needs to be made in exhibit No. 1, paragraph 6.

c) Provision 6, Part II, must be revised to include contractor certification of compatability of your mobile substation with Ft Greelys 2400 V Delta system.

Discussions concerning the above mentioned items can be started when Mr. Russell meets with you on 20 Nov.

If you have any questions concerning this contract please contact Steve Russell at (907) 384-7088.

Sincerely,

Margaret H. Iskra
Contracting Officer

UTILITIES SERVICE CONTRACT

The Department of the Army
Directorate of Contacting
P.O. Box 5-525
Fort Richardson, Alaska 99505-0525

Contract No. DAHC76-92-C-0009

Golden Valley Electric Association
(Contractor)

758 Illinois Ave
Fairbanks, Alaska 99707
(Contractor's Address)

Premises to be Served: Fort Greely, Alaska

Estimated annual cost of Electricity:

This contract is negotiated pursuant to 10 U.S.C. 2304(c)(1). This contract is entered into as of July 15, 1992 by and between the UNITED STATES OF AMERICA, hereinafter called the Government, represented by the Contracting Officer executing this contract and GOLDEN VALLEY ELECTRIC ASSOCIATION whose address is 758 Illinois Ave, Fairbanks, Alaska 99707, hereinafter called the Contractor.

PART I - SCOPE AND TERM OF CONTRACT

A. SCOPE.

In accordance with the terms and general provisions and subject to the conditions hereinafter set forth, the Contractor shall furnish, and the Government shall purchase and receive at Fort Greely, Alaska electrical service (hereinafter called "purchased"), and transmission of Government provided electricity (hereinafter called Wheeling) from the power plant at Fort Wainwright, Alaska to the Fort Greely, Alaska power plant.

B. TERM.

This contract shall continue in effect until terminated at the option of either party by the giving of a written 180 day notice in advance of the effective date of termination.

IN WITNESS THEREOF, the parties hereto mutually agree and have executed this contract as of the day and year first above written.

UNITED STATES OF AMERICA

Golden Valley Electric Association, Inc.
Name of Contractor

BY

Mike Kelly
Signature

Michael P. Kelly
Typed Name

BY

Donald L. Hickey 21 Jul 92
Signature of Contracting Officer
and Date

Donald L. Hickey
Typed Name of Contracting Officer

Title General Manager

APPROVED BY

Wayne Urada
Signature

Wayne Urada
Typed Name of USARPAC Army Power
Procurement Officer

PART II - TECHNICAL AND GENERAL PROVISIONS FOR UTILITY SERVICE

A. TECHNICAL PROVISIONS.

1. MEASUREMENT OF SERVICE

(a) All service furnished by the Contractor shall be measured by metering equipment of standard manufacture, furnished, installed, maintained, calibrated, and read by the Contractor at his expense. When more than a single meter is installed at the service location, the reading thereof shall be billed separately. In the event that any meter fails to register or registers incorrectly, the quantity of service delivered through it during that period shall be determined and an equitable adjustment based thereon shall be made in the Government's bills (for this purpose any meter which registers not more than two (2) percent slow or fast shall be deemed correct). Failure to agree on any adjustment shall be a dispute concerning a question of fact within the meaning of the "Disputes" clause of this contract.

(b) The Contractor shall read all meters at periodic intervals of approximately thirty (30) days.

(c) The Contractor shall annually calculate the wheeling line loss based on the metering data from the preceding 12 month period beginning 01 October thru 30 September. If the system parameters change during this period due to construction or major repairs, new wheeling line losses will be calculated and submitted within 30 days of upgrade completion.

2. METER TEST.

The Contractor, at his expense, shall periodically inspect and test the meters installed by him, at intervals of no longer than one (1) year or in accordance with the Contractor's standard/regulated practices, whichever is more frequent. At the written request of the Contracting Officer, the Contractor, in the presence of Government representatives, shall make additional tests of any or all meters. The cost of additional tests shall be borne by the Government if the percentage of error is found to be not more than two (2) percent slow or fast. No meter shall be placed in service which on test registers in excess of one hundred (100) percent under normal operating conditions. Testing inspection reports shall be submitted to the Contracting Officer.

B. GENERAL PROVISIONS

1. PAYMENT.

(a) The Contractor shall submit the original and one copy of company invoices which identify the contract number, month of service, quantity of kw used during that period, unit price/current GS rate, demand charge, quantity of wheeled electricity and (minimum billing amounts, if any) to:

Directorate of Public Works
Attn: APVR-DE-OM, Utility Engineer Officer
Fort Richardson, Alaska 99505

and one copy to:

Directorate of Public Works
Attn: APVR-FW-DE-OM, Utility Engineer Officer
Fort Wainwright, Alaska 99707

Payment will be made by:

6th Inf Div (L)
Finance and Accounting Office
Attn: APVR-RM-FPA
Fort Richardson, Alaska 99505

(b) Recognition is given to the fact that the Government fiscal year ends on 30 September. Payments for electrical service hereunder shall be contingent upon the availability of appropriations therefor, and shall not be made in advance of service rendered.

(c) All bills for service shall be entitled to any discounts customarily applicable to payment of bills by all customers of the Contractor. Late payment interest shall be paid in accordance with FAR 52.232-25, Prompt Payment.

(d) Invoices for service rendered hereunder shall contain statements of the meter readings at the beginning of the billing period, meter constants, consumption during the billing period, and such other pertinent data as shall be required by the Government.

(e) The contractor hereby declares that the rates are not in excess of the lowest rates now available to any existing or prospective customer under like conditions of service, or of the same classifications, and agrees that during the life of this contract the Government shall continue to be billed at the lowest available rate for similar conditions of service.

2. RATES AND CHARGES

(a) Purchased Electricity: Shall be based on the Contractors tariff rate schedule No. GS-II dated September 21, 1982 and shall be adjusted to the most current quarterly Cost of Power adjustment.

(b) Wheeled Electricity: The Energy Charge rate for wheeling Government furnished electricity from Ft Wainwright to Ft Greely, Alaska shall be Seventeen point Six Four percent (17.64%) of the energy charge calculated under the GS-II schedule, dated 21 Sep 82, (excluding COP adjustments) for the quantity of KWH's wheeled during that period. Fort Wainwright's kilowatt output will not exceed 120% of Fort Greely's immediate demand.

(c) Demand Charge: Demand charges will be based on GVEA's GS-II scheduled rate of \$6.25 per Kw for the highest average kw usage in any fifteen minute period during the billing period.

(d) Method of Measurement for Quantities Wheeled or Purchased:
The method for measuring quantities of kwhrs either purchased or wheeled will be calculated by measuring the total output from Fort Wainwright (for wheeling purposes), less a line loss of eleven point one percent, 11.1% for wheeling only, then subtracting the adjusted Fort Wainwright output from the total kwhrs received at Fort Greely to determine the total quantity purchased. (see exhibit 2)

3. CHANGE OF RATES

(a) The Government recognizes that for certain purposes GVEA is subject to regulation by the Alaska Public Utilities Commission. However the Government does not consent to any contractual authority nor jurisdiction of the APUC concerning this agreement in whole or in part.

(b) In the event the Contractor, during the term of this contract, makes effective any new or amended rate schedule, not incorporated herein directly or indirectly, applicable to any like condition of service furnished under this contract which contains a lower rate or condition more favorable to the Government, the contractor shall forward to the Contracting Officer a copy of the new or amended rate schedule within fifteen (15) days after the effective date thereof, and upon receipt of a written request from the Government shall substitute the new or amended rate schedule from the effective date thereof.

4. CHANGE IN VOLUME OR CHARACTER OF SERVICE

The Contracting Officer shall give reasonable notice to the Contractor respecting any significant material changes anticipated in the electric demand, consumption or characteristics of the electric service required at Fort Greely.

5. CONTINUITY OF SERVICE AND CONSUMPTION

(a) The Contractor shall use reasonable diligence to provide a regular and uninterrupted supply of service at the designated service location, but shall not be liable to the Government for damages, breach of contract, or otherwise, for failure, suspension, diminution, or other variations of service occasioned by any cause beyond the control and without the fault or negligence of the Contractor. Such causes may include, but are not restricted to, acts of God or of the public enemy, acts of the Government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, or failures or breakdowns of transmission or other facilities; provided that when any failure, suspension, diminution, variation of service shall aggregate more than seventy two (72) hours during any billing period hereunder, an equitable adjustment shall be made in the monthly rates specified in this contract (including the minimum monthly charge).

(b) In the event the Government is unable to operate the service location in whole or in part for any cause beyond its control and without its fault or negligence, including but not limited to act of God or of the public enemy, fires, floods, epidemics, quarantine restrictions, or strikes, an equitable adjustment shall be made in the monthly rates specified in this contract (including the minimum billing charge) if the period during which the Government is unable to operate the service location in whole or in part shall exceed seventy two (72) hours during any billing period hereunder.

6. CONTRACTOR'S FACILITIES

(a) The Contractor at his expense, shall furnish, install, operate, and maintain all facilities required to furnish service to, and measure the service at, the point of delivery specified in the Electrical Service Specifications. Title to all of these facilities shall remain in the Contractor and he shall be responsible for all loss of or damage to those facilities except that arising out of the fault or negligence of the Government, its agents or its employees. All taxes and or other charges in connection therewith, together with all liability arising out of negligence of the Contractor in the construction, operation, or maintenance of these facilities shall be assumed by the Contractor.

(i) Due to the age and present condition of the 2500 kva transformer the Government will reimburse the Contractor, subject to the availability of funds, for reasonable costs associated with required repairs other than routine maintenance/repairs. The Contractor must notify the Contracting Officer prior to initiating any reimbursable repairs.

(ii) In the event of failure of the existing transformer, Golden Valley will use their existing mobile substation as a backup transformer unit. This mobile substation is rated at 20,000 KVA at 138 KV high side and 7200/12470Y. The Army will designate a temporary site for the purpose and use of the mobile substation at the power plant, building 606, Fort Greely. In the event GVEA has a requirement for use of the mobile substation at another site, Fort Greely will utilize its on-site generation capability to meet its load until GVEA's requirement no longer exists at which time GVEA will make their best faith effort to remobilize, at the Government's expense, the mobile substation for use at Fort Greely.

(iii) GVEA is not obligated to utilize the mobile substation at Fort Greely for more than eighteen months, or until costs are negotiated and installation is completed for a permanent replacement transformer, whichever is earlier.

(b) The Government hereby grants to the Contractor, free of any rental or similar charge, but subject to the limitations specified in this contract, a revocable permit to enter the service location for any proper purpose under this contract, including use of the site or sites agreed upon by the parties hereto for the installation, operation, and maintenance of the facilities of the Contractor required to be located upon Government premises.

Authorized representatives of the Contractor will be allowed access to the facilities of the Contractor at suitable times to perform the obligations of the Contractor with respect to those facilities. It is expressly understood that the Government may limit or restrict the right of access herein granted in any manner considered to be necessary for the national security.

(c) The facilities shall be removed and Government premises restored to their original condition, ordinary wear and tear excepted, by the Contractor at his expense within a reasonable time after the Government shall revoke the permit herein granted and in any event within a reasonable time after termination of this contract, provided, that in the event of termination due to fault of the Contractor these facilities may be retained in place at the option of the Government until service comparable to that provided for hereunder is obtained elsewhere.

7. CONFLICTS.

To the extent of any inconsistency between the provisions of this contract, and the provisions of any schedule, rider, or exhibit incorporated in this contract by reference or otherwise, the provisions of this contract shall control.

CLAUSE INCORPORATED BY REFERENCE

This contract incorporates the following clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their text available.

- (1) 52.201-1 Definitions (APR 1984)
- (2) 52.252-6 Authorized Deviations or Variations in Clauses (JUL 1985)
- (3) 52.203-1 Officials Not to Benefit (APR 1984)
- (4) 52.203-3 Gratuities (APR 1984)
- (5) 52.203-5 Covenant Against Contingent Fees (APR 1984)
- (6) 52.208-3 Conflicts (APR 1984)
- (7) 52.223-2 Clean Air and Water Act (APR 1984)
- (8) 52.223-6 Drug Free Work Place (MAR 1989)
- (9) 52.222-3 Convict Labor (APR 1984)
- (10) 52.222-4 Contract Work Hours and Safety Standards Act-Overtime Compensation (MAR 1986)
- (11) 52.222-26 Equal Opportunity (APR 1984)
- (12) 52.222-35 Affirmative Action for Special Disabled and Vietnam Era Veterans (APR 1984)
- (13) 52.222-36 Affirmative Action for Handicapped Workers (APR 1984)
- (14) 52.232-11 Extras (APR 1984)
- (15) 52.232-23 Assignment of Claims (JAN 1986)
- (16) 52.232-25 Prompt Payment (APR 1989)
- (17) 52.233-1 Disputes (APR 1984)
- (18) 52.215-1 Examination of Records By Comptroller General (APR 1984)
- (19) 52.225-7001 Buy American Act and Balance of Payments Program (APR 1985)
- (20) Reserved
- (21) Reserved
- (22) Reserved
- (23) Reserved

24. REQUIREMENT FOR CERTIFICATE OF PROCUREMENT INTEGRITY (NOV 1990)
(52.203-8)

(a) Definitions. The definitions in FAR 3.104-4 are hereby incorporated in this provision.

(b) Certifications. As required in paragraph (c) of this provision, the officer or employee responsible for this offer shall execute the following certification:

CERTIFICATE OF PROCUREMENT INTEGRITY

(1) I [Michael P. Kelly], am the officer or employee responsible for the preparation of this offer and hereby certify that, to the best of my knowledge and belief, with the exception of any information described in this certificate, I have no information concerning a violation or possible violation of subsection 27 (a), (b), (d), or (f) of the Office of Federal Procurement Policy Act, as amended* (41 U.S.C 423), (herein after referred to as "The Act"), as implemented in the FAR, occurring during the conduct of this procurement (DAHC76-92-C-0009).

(2) As required in subsection 27 (e) (1) (B) of the Act, I further certify that, to the best of my knowledge and belief, each officer, employee, agent, representative, and consultant of Golden Valley Electric Association who has participated personally and substantially in the preparation or submission of this offer has certified that he or she is familiar with, and will comply with, the requirements of subsection 27 (a) of the Act, as implemented in the FAR, and will report immediately to me any information concerning a violation or possible violation of the Act, as implemented in the FAR, pertaining to this procurement.

(3) Violations or possible violations: (Continue on plain bond paper if necessary and label Certificate of Procurement Integrity Continuation Sheet), ENTER NONE IF NONE) NONE

(4) I agree that, if awarded a contract under this solicitation, the certifications required by subsection 27 (e) (1) (B) of the Act shall be maintained in accordance with paragraph (f) of this provision.

SIGNATURE OF THE OFFICER OR EMPLOYEE RESPONSIBLE FOR THE OFFER AND
DATE

Michael P. Kelly

TYPED NAME OF THE OFFICER OR EMPLOYEE RESPONSIBLE FOR THE OFFER

Michael P. Kelly

* Subsections 27(a), (b) and (d) are effective on December 01, 1990. Subsection 27(f) is effective on June 01, 1991.

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER TITLE 18, UNITED STATES CODE, SECTION 1001.

(End of Certification)

(c) For procurements, including contract modifications, in excess of \$100,000 made using procedures other than sealed bidding, the signed certifications shall be submitted by the successful offeror to the Contracting Officer within the time period specified by the Contracting Officer when requesting the certificates except as provided in subparagraphs (c)(1) through (c)(5) of this clause. In no event shall the certificate be submitted subsequent to award of a contract or execution of a contract modification:

(1) For letter contracts, other unpriced contracts, or unpriced contract modifications, whether or not the unpriced contract or modification contains a maximum or not to exceed price, the signed certifications shall be submitted prior to the award of the letter contract, unpriced contract, or unpriced contract modification, and prior to the definitization of the letter contract or the establishment of the price of the unpriced contract or unpriced contract modification. The second certification shall apply only to the period between award of the letter contract and execution of the document definitizing the letter contract, or award of the unpriced contract or unpriced contract modification and execution of the document establishing the definitive price of such unpriced contract or unpriced contract modification.

(2) For basic ordering agreements, prior to the execution of a priced order; prior to the execution of an unpriced order, whether or not the unpriced order contains a maximum or not to exceed price; and, prior to establishing the price of an unpriced order. The second certificate to be submitted for unpriced orders shall apply only to the period between award of the unpriced order and execution of the document establishing the definitive price for such order.

(3) A certificate is not required for indefinite delivery contracts (see Subpart 16.5) unless the total estimated value of all orders eventually to be placed under the contract is expected to exceed \$100,000.

(4) For contracts and contract modifications which include options, a certificate is required when the aggregate value of the contract or contract modification and all options (see 3.104-4(e)) exceeds \$100,000.

(5) For purposes of contracts entered into under section 8(a) of the SBA, the business entity with whom the SBA contracts, and not the SBA, shall be required to comply with the certification requirements of subsection 27(e). The SBA shall obtain the signed certificate from the business entity and forward the certificate to the Contracting Officer prior to the award of a contract to the SBA.

(6) Failure of an Offeror to submit the signed certificate within the time prescribed by the Contracting Officer shall cause the offer to be rejected.

(d) Pursuant to FAR 3.104-9(d), the Offeror may be requested to execute additional certifications at the request of the Government. Failure of an Offeror to submit the additional certifications shall cause its offer to be rejected.

(e) A certification containing a disclosure of a violation or possible violation will not necessarily result in the withholding of award under this solicitation. However, the Government, after evaluation of the disclosure, may cancel this procurement or take any other appropriate actions in the interests of the Government, such as disqualification of the Offeror.

(f) In making the certification in paragraph (2) of the certificate, the officer or employee of the competing Contractor responsible for the offer may rely upon a one-time certification from each individual required to submit a certification to the competing Contractor, supplemented by periodic training. These certifications shall be obtained at the earliest possible date after an individual required to certify begins employment or association with the Contractor. If a Contractor decides to rely on a certification executed prior to the suspension of section 27 (i.e., prior to December 1, 1989), the Contractor shall ensure that an individual who has so certified is notified that section 27 has been reinstated. These certifications shall be maintained by the Contractor for 6 years from the date a certifying employee's employment with the company ends or, for an agent, representative, or consultant, 6 years from the date such individual ceases to act on behalf of the Contractor.

(g) Certifications under paragraphs (b) and (d) of this provision are material representations of fact upon which reliance will be placed in awarding a contract. (End of provision)

25. REQUIREMENT FOR CERTIFICATE OF PROCUREMENT INTEGRITY MODIFICATION
(NOV 1990) (52.203-9)

(a) Definitions. The definitions in FAR 3.104-4 are hereby incorporated in this clause.

(b) The Contractor agrees that it will execute the certification set forth in paragraph (c) of this clause when requested by the Contracting Officer in connection with the execution of any modifications of this contract.

(c) Certifications. As required in paragraph (b) of this provision, the officer or employee responsible for this offer shall execute the following certification:

CERTIFICATE OF PROCUREMENT INTEGRITY - MODIFICATION (NOV 1990)

(1) I [Michael P. Kelly], am the officer or employee responsible for the preparation of this modification proposal and hereby certify that, to the best of my knowledge and belief, with the exception of any information described in this certificate, I have no information concerning a violation or possible violation of subsection 27 (a), (b), (d), or (f) of the Office of Federal Procurement Policy Act, as amended* (41 U.S.C 423), (herein after referred to as "The Act"), as implemented in the FAR, occurring during the conduct of this procurement, contract No DAHC76-92-C-0009 and modification No. P.

(2) As required in subsection 27 (e) (1) (B) of the Act, I further certify that, to the best of my knowledge and belief, each officer, employee, agent, representative, and consultant of Golden Valley Electric Association who has participated personally and substantially in the preparation or submission of this proposal has certified that he or she is familiar with, and will comply with, the requirements of subsection 27 (a) of the Act, as implemented in the FAR, and will report immediately to me any information concerning a violation or possible violation of subsections 27(a), (b), (d), or (f) of the Act, as implemented in the FAR, pertaining to this procurement.

(3) Violations or possible violations: (Continue on plain bond paper if necessary and label Certificate of Procurement Integrity -Modification (Continuation Sheet), ENTER NONE IF NONE) NONE

SIGNATURE OF THE OFFICER OR EMPLOYEE RESPONSIBLE FOR THE MODIFICATION PROPOSAL AND DATE.

Michael Kelly

TYPED NAME OF THE OFFICER OR EMPLOYEE RESPONSIBLE FOR THE MODIFICATION PROPOSAL.

Michael P. Kelly

*Subsections 27 (a), (b), and (d) are effective on December 01, 1990. Subsection 27 (f) is effective on June 01, 1991. THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER TITLE 18, UNITED STATES CODE, SECTION 1001. (End of Certification)

(d) In making the certification in paragraph (2) of the certificate, the officer or employee of the competing Contractor responsible for the offer or bid, may rely upon a one-time certification from each individual required to submit a certification to the competing Contractor, supplemented by periodic training. These certifications shall be obtained at the earliest possible date after an individual required to certify begins employment or association with the Contractor. If a Contractor decides to rely on a certification executed prior to the suspension of section 27 (i.e., prior to December 1, 1989), the Contractor shall ensure that an individual who has so certified is notified that section 27 has been reinstated. These certifications shall be maintained by the Contractor for a period of 6 years from the date a certifying employee's employment with the company ends or, for an agency, representative, or consultant, 6 years from the date such individual ceases to act on behalf of the Contractor.

(e) The certification required by paragraph (c) of this clause is a material representation of fact upon which reliance will be placed in executing this modification. (End of clause)

II.B. ADDITIONAL GENERAL PROVISIONS

26. APPROVAL OF CONTRACT (DEC 1989) (FAR 52.204.01)

a. This contract is subject to the written approval by the U.S. Army Power Procurement Officer and will not be binding until so approved.

27. ALTERATIONS IN CONTRACT (APR 1984) (FAR 52.252.04)

Portions of this contract are altered as follows: NONE

28. CONTRACT MODIFICATION (FAR 43.102)

The Contracting Officer is the only individual authorized to redirect the effort or in any way modify any of the terms and conditions of this contract.

29. CONTACT FOR CONTRACT ADMINISTRATION

Please designate a person whom we may contact for contract administration.

NAME: Robert J. Hansen TITLE: Manager of Administrative Services

TELEPHONE: 907-452-1151, ext. 602 FAX: 907-451-5633

ADDRESS: GVEA, PO Box 71249, Fairbanks AK 99707-1249

30. CAPITAL CREDITS

The Contractor is required to report in writing to the Contracting Officer the amount of capital credits attributable to the United States share in the Association. This report shall be made annually, but not later than 30 June each year.

EXHIBIT NO. 1

ELECTRICAL SERVICE SPECIFICATIONS

1. SPECIFIC PREMISES TO BE SERVED: Fort Greely, Alaska.
Account #101-441000

2. ESTIMATED SERVICE REQUIREMENTS:

Estimated maximum demand: 3500 KW
Estimated annual consumption: 17,000,000 KWH

(The Government is in no way obligated to use nor is it restricted to the above estimate.)

3. POINT OF DELIVERY: The point of delivery of service shall be the load side of the primary (2400 volt) meter installation which serves Building 606, Fort Greely, Alaska.

4. DESCRIPTION OF ELECTRIC SERVICE: Contractor will supply 3 phase 3 wire, 60 cycle, alternating current at 2400 volts delta. The voltage of contractor's high tension line is 14.4/24.9 kilovolts. Substation transformer normal capacity 2500 KVA. Switching apparatus high side, fused disconnects. Substation transformer and metering package owned and maintained by Golden Valley Electric Association, Inc.

5. METERING AND BILLING: Service will be measured at 2400 volts by a watt hour/demand meter. The kwh and demand will be billed in accordance with contract General Provision II B. 2., Rates & Charges. The Contractor will supply and maintain the meter. The Government will supply the 2400 volt service entrance equipment and main disconnects.

6. VOLTAGE AND FREQUENCY. The energy delivered to the 2400 volt meter location shall be regulated such that the steady state frequency shall not deviate from 60 Hertz by more than plus or minus, one cycle per second, and the steady state voltage range at the 2400 volt nominal side of the transformer shall be from 2280 volts to 2520 volts (114 volts to 126 volts nominal base), per REA Bulletin 169-4, Voltage Levels on Rural Distribution Systems, and ANSI C84.1-1970, Voltage Ratings for Electric Power Systems and Equipment (60 Hz).

Attachment to Exhibit 1

NARRATIVE DESCRIPTION OF CONNECTION FACILITIES

The existing Golden Valley facilities which provide the service to Fort Greely consist of a radial feeder from Jarvis Creek Substation, high side fused disconnects, single step-down transformer, primary meter installation, including miscellaneous jumpers, connectors, and structures.

The main component of the existing service is a 2500 KVA continuous, self-cooled, three phase, 60 Hz, transformer, which is suitable for 3125 KVA with the addition of additional approved cooling equipment. The high side voltage is 24940Y/14400 and the low side voltage is 2400 delta. The transformer was constructed by Moloney Electric in November 1961 and has an impedance of 5.95% at 2500 KVA. At present cooling fans are not installed which limit the normal summer transfers to 2500 KVA. Fan installation will allow for the release of presently limited capacity up to 3125 KVA. With fan installation and real time monitoring of the oil temperature and hot spot oil temperature, additional capacity above the 3125 may be available.

EXHIBIT NO. 2

Energy charge Formula for determining total quantities wheeled or purchased during a billing period.

$$\begin{aligned} \text{FWO} - 11.1\% &= \text{WE} \\ \text{FGR} - \text{WE} &= \text{PE} \end{aligned}$$

Where:

FWO = Fort Wainwright adjusted output

FGR = Total of kwhrs received at Fort Greely

PE = Purchased electricity, kwhrs

WE = Wheeled electricity, kwhrs; FWO less line loss of 11.1%

Example: FWO = 1,000,000 kwhrs

FGR = 1,500,000 kwhrs

Peak Demand = 3000 kw

FWO 1,000,000 kwhrs - 11.1% = WE of 889,000 kwhrs

FGR 1,500,000 kwhrs - WE of 889,000 kwhrs = PE of 611,000 kwhrs

Billings:

Energy Chg

WE = 889,000

PE = 611,000

Demand

3000 kw

EXHIBIT NO. 3

ELECTRICAL SERVICE SPECIFICATIONS

1. SPECIFIC PREMISES TO BE SERVED: Central Power Plant, Fort Wainwright, Alaska.

2. ESTIMATED SERVICE REQUIREMENTS.

Estimated maximum demand: 5,500 KW

Estimated maximum annual consumption: 800,000 KWH

(The Government is in no way obligated to use nor is it restricted to the above estimate.)

3. POINT OF DELIVERY:

4. DESCRIPTION OF ELECTRIC SERVICE: The Contractor will supply 3 phase 3 wire, 60 cycle, alternating current at 7200 volts. The voltage of the Contractor's high tension line is 69 kv. Substation transformers: normal capacity 7.5 MVA.

5. METERING AND BILLING: Service will be measured at 120/240 volts by one watt hour meter. Charges will be billed in accordance with APUC tariff No. 13, Schedule No. GS-2, Eighth Revision, Advise No. 28, effective September 1, 1982. The Contractor will supply and maintain the meter. The Government will supply the 2400 volt service entrance equipment and main disconnects. Monthly billings, based on a minimum demand charge of 2500 KW will be paid.

6. ALTERATION AND ADDITIONS: Meters and transformers will remain the property of the Contractor.

APPENDIX C

**LIFE CYCLE COST ANALYSIS, FORM DD 1391
AND COST ESTIMATES**

**ALTERNATIVE 1 AND ALTERNATIVE 2
LIFE CYCLE COST ANALYSIS**

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA	2. DATE Feb-95
3. INSTALLATION AND LOCATION Ft Wainwright Power Plant, Fairbanks, Alaska		
4. PROJECT TITLE Limited Energy Study - Low Pressure Turbine - Alternate 1		5. PROJECT NUMBER

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: Ft Wainwright, Fairbanks, Alaska	REGION: 4	PROJECT NO: 1406-002
PROJECT TITLE: Limited Energy Study - Low Pressure Turbine		FISCAL YEAR: 1995
DISCRETE PORTION NAME: TOTAL		
ANALYSIS DATE: 02/17/95	ECONOMIC LIFE: 20	PREPARED BY: B. Ryan

1. INVESTMENT

A. CONSTRUCTION COST	=	\$2,358,017
B. SIOH COST (8.5% of 1A)	=	\$200,431
C. DESIGN COST (6.0% of 1A)	=	\$141,481
D. TOTAL COST (1A + 1B + 1C)	=	\$2,699,929
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$80,000
F. PUBLIC UTILITY COMPANY REBATE	=	
G. TOTAL INVESTMENT (1D - 1E - 1F)	=	\$2,619,929

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR-4942-1 USED FOR DISCOUNT FACTORS: JAN '94

ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELEC*	\$0.00	0	\$408,182	15.64	\$6,383,966
B. DIST	\$0.00	0	(\$242,450)	-	\$0
C. NAT GAS	\$0.00	0	\$0	-	\$0
D. REFUS	\$0.00	0	\$0	-	\$0
E. COAL	\$0.00	0	(\$250,571)	16.83	(\$4,217,110)
F. OTHER			\$0	-	\$0
G. DEMAND SAVINGS			\$576,025	14.74	\$8,490,609
H. TOTAL		0	\$491,186		\$10,657,465

\$/MJ= \$0.00 0 =MJ/YR

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)		(\$14,460)
1 DISCOUNT FACTOR	(From Table A) =	14.74
2 DISCOUNTED SAVINGS (+) / COST (-)	(3A x 3A1) =	(\$213,140)

B. NON-RECURRING (+/-)		
ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)
		DISCOUNT FACTOR (3)
		DISCOUNTED SAVINGS/COST (4)
(TABLE B)		
a. MAINTENANCE:		0
		0.00
b. MATERIAL: NONE	\$0	0
		0.00
c. MATERIAL: NONE	\$0	0
		0.00
d. TOTAL	\$0	
		\$0

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A2 + 3Bd4) =	(\$213,140)
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4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2H3+3A+(3Bd1/Economic Life)) \$476,726
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 5.50
6. TOTAL NET DISCOUNTED SAVINGS (2H5 + 3C) = \$10,444,325
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1 G) = 3.99

(MUST HAVE SIR > 1.25 TO QUALIFY)

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA	2. DATE Feb-95
3. INSTALLATION AND LOCATION Ft Wainwright Power Plant, Fairbanks, Alaska		
4. PROJECT TITLE Limited Energy Study - Low Pressure Turbine - Alternative 2		5. PROJECT NUMBER

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: Ft Wainwright, Fairbanks, Alaska	REGION: 4	PROJECT NO: 1406-002
PROJECT TITLE: Limited Energy Study - Low Pressure Turbine		FISCAL YEAR: 1995
DISCRETE PORTION NAME: TOTAL		
ANALYSIS DATE: 02/17/95	ECONOMIC LIFE: 20	PREPARED BY: B. Ryan

1. INVESTMENT

A. CONSTRUCTION COST	=	\$2,265,119
B. SIOH COST (8.5% of 1A)	=	\$192,535
C. DESIGN COST (6.0% of 1A)	=	\$135,907
D. TOTAL COST (1A + 1B + 1C)	=	\$2,593,561
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$0
F. PUBLIC UTILITY COMPANY REBATE	=	
G. TOTAL INVESTMENT (1D - 1E - 1F)	=	\$2,593,561

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR-4942-1 USED FOR DISCOUNT FACTORS: JAN '94

ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELEC	\$0.00	0	\$408,182	15.64	\$6,383,966
B. DIST	\$0.00	0	(\$242,450)	-	\$0
C. NAT GAS	\$0.00	0	\$0	-	\$0
D. REFUS	\$0.00	0	\$0	-	\$0
E. COAL	\$0.00	0	(\$250,571)	16.83	(\$4,217,110)
F. OTHER			\$0	-	\$0
G. DEMAND SAVINGS			\$576,025	14.74	\$8,490,609
H. TOTAL		0	\$491,186		\$10,657,465

\$/MJ = \$0.00 0 = MJ/YR

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)		(\$15,960)
1 DISCOUNT FACTOR	(From Table A) =	14.74
2 DISCOUNTED SAVINGS (+) / COST (-)	(3A x 3A1) =	(\$235,250)

B. NON-RECURRING (+/-)		
ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCURRENCE (2)
a. MAINTENANCE:	\$0	0
b. MATERIAL: NONE	\$0	0
c. MATERIAL: NONE	\$0	0
d. TOTAL	\$0	

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A2 + 3Bd4) =	(\$235,250)
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4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2H3+3A+(3Bd1/Economic Life)) \$475,226
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 5.46
6. TOTAL NET DISCOUNTED SAVINGS (2H5 + 3C) = \$10,422,215
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1 G) = 4.02

(MUST HAVE SIR > 1.25 TO QUALIFY)

E M C ENGINEERS, INC.

2750 S. Wadsworth Blvd. 9755 Dogwood Rd.
Suite C-200 Suite 220
Denver, CO 80227 Roswell, GA 30075
(303) 988-2951 (404) 642-1864

JOB FT. WAINWRIGHT TURBINE STUDY

SHEET NO. _____ OF _____

CALCULATED BY BR DATE 2/6/95

CHECKED BY _____ DATE _____

SCALE _____

TURBINE-GENERATOR MAINTENANCE COSTS.**ALTERNATIVE 1 (REPLACE TG-1 W/ CONDENSING TG)**

A.) MAINTENANCE FOR CONDENSER CLEANING;

FROM FT. WAINWRIGHT PERSONNEL;

ANNUAL HRS = 18 HRS (18 TIMES/YR) = 324 HRS YR.

MAINTENANCE COST = \$40/Hr (324 HRS) = 12,960 YR

B.) TURBINE MAINTENANCE;

PER TURBINE-GENERATOR MANUFACTURER; (SEE RECORD OF VERBAL QUOTE)

OVER 20 YR LIFE SPAN, MAINTENANCE COST = \$30,000

ANNUAL COST = $\frac{\$30,000}{20 \text{ YR}} = \$1,500/\text{YR}$

TOTAL MAINTENANCE = A + B = \$12,960 + \$1,500 = \$14,460

ALTERNATIVE 2 (INSTALL NEW TG DOWNSTREAM OF EXISTING TG-1)

SAME AS ABOVE, EXCEPT TURBINE MAINTENANCE REQUIRED ON TWO MACHINES.

TOTAL MAINTENANCE = A + 2B = \$12,960 + (2) \$1,500 = \$15,960

RECORD OF VERBAL QUOTE

Quote No. 1

Date: 6 Feb 95

Company: FRY EQUIPMENT CO., INC.

Location: DENVER, CO 2600 W. 2ND AVE.

Telephone No: (303) 922-8442

Person Talked to: WAYNE FRY

Scope/Description/Amount of Quote: 20 YR
~~ANNUAL~~ MAINTENANCE COST FOR
5 MW STEAM TURBINE GENERATOR, ACCORDING TO MURRAY
TURBINE MANUFACTURES:

THE 20 YR LIFE MAINTENANCE COST FOR A 5 MW
TURBINE LARGELY DEPENDS ON THE STEAM CONDITIONS.
HOWEVER, FOR ESTIMATING PURPOSES FOR A REPAIR,
\$30,000 FOR A 20 YEAR LIFE SPAN SHOULD BE ADEQUATE.
OR \$1500 ANNUAL. ◀

THIS CONSISTS OF INSPECTING THE TUBING EVERY 5 YEARS,
REPLACING BEARINGS AND REPAIRS TO BLADES AS NECESSARY.

Type of Quote: ☒ Material Cost only (FOB Point: N/A)
☒ Labor Cost Only
☐ Installed Cost

Sales Tax: ☐ Included, Rate %
☒ Not Included

Project: FT. WAINWRIGHT, AK, LIMITED ENERGY STUDY, LOW PRESSURE TURBINE

Location: FAIRBANKS, ALASKA

Quote Received By: BRAD RYAN

Form DD 1391

1. COMPONENT ARMY		FY 1995 MILITARY CONSTRUCTION PROJECT DATA			2. DATE FEB 95	
3. INSTALLATION AND LOCATION Ft. Wainwright Power Plant, Fairbanks, Alaska				4. PROJECT TITLE Limited Energy Study, Low Pressure Turbine		
5. PROGRAM ELEMENT		6. CATEGORY CODE		7. PROJECT NUMBER		8. PROJECT COST (\$000)
9. COST ESTIMATES						
ITEM				U/M	QUANTITY	COST (\$000)
ECIP: ALT 1 Turbine Installation				LS		2358
TOTAL CONTRACT COST						2358
SIOH (8.5%)						200
DESIGN COST (6%)						142
TOTAL PROJECT COST						2700
SALVAGE VALUE						80
TOTAL REQUEST (Rounded)						2620
10. DESCRIPTION OF PROPOSED CONSTRUCTION Install new condensing 5MW turbine generator. The installation of the turbine generator will avoid high demand and electrical energy charges from the local utility.						
11. REQUIREMENT: Project: This Energy Conservation Investment Program (ECIP) project will replace an existing back pressure turbine generator with a new condensing turbine generator. Ft. Wainwright Power Plant provides electrical energy to Ft. Wainwright. The power plant also provides electrical energy to Ft. Greely by the use of Golden Valley Electric Association transmission lines. Requirements: This project is required for Ft. Wainwright to produce power independently of the local utility. A utility savings would be recognized. Current Situation: The existing back pressure turbine can not be operated except during periods when outside temperatures fall below - 30°F. As a result, Ft. Wainwright and Ft. Greely must purchase power from the local utility company when one of the three existing condensing turbine generators requires maintenance. Impact If Not Provided: Failure to accomplish this project will cause the Department of the Army, Alaska District to not realize a \$476,726 annual savings with a 5.50 year simple payback and a savings-to-investment ratio of 3.99. Supporting Documentation: Supporting data for basic engineering calculations which show energy savings and cost savings are documented in a report under an Army Contract performed by an A-E firm in FY95. Verification of Savings: The Ft. Wainwright and Ft. Greely facilities have existing kilowatt hour (kWh) meters. Historic data was obtained for the period of September 1993 through August 1994 as a basis for the report mentioned above.						

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA	2. DATE FEB 95
3. INSTALLATION AND LOCATION Ft. Wainwright Power Plant, Fairbanks Alaska		
4. PROJECT TITLE Limited Energy Study, Low Pressure Turbine		5. PROJECT NUMBER
<p>ECONOMIC ANALYSIS</p> <p>11B. Economic Justification Summary</p> <p>Life Cycle Cost Analysis Data Base</p> <p>The cost estimate was prepared using MCACES GOLD cost estimating system. The total investment cost for the proposed modification including contingency, SIOH, and design cost is \$2,619,929.</p> <p>Electrical savings will be obtained when the turbine generator is installed by avoiding cost from the local utility company, Golden Valley Electric Association (GVEA). Electrical energy costs are purchased from GVEA by Ft. Wainwright and Ft Greely. Ft. Greely also pays for the use of GVEA transmission lines. The cost for use of the transmission lines can not be avoided and are included in the life cycle cost analysis.</p> <p>Electrical services provided by GVEA consist of electrical energy use (kWh), demand (kW), wheeling (for transmission lines), and miscellaneous charges. Actual utility bills for the electrical services were obtained for Ft. Wainwright and Ft. Greely for the period from September 1993 to August 1994.</p> <p>The annual electrical energy provided from GVEA to Ft. Wainwright was 1,161,010 kWh. The annual cost for electrical services was \$442,237. The annual savings for Ft. Wainwright is \$442,237 minus the additional coal cost minus the maintenance cost.</p> <p>The additional coal cost is the amount of energy Ft. Wainwright must produce to replace the 1,161,010 kWh previously provided by GVEA. The estimated coal cost was based on actual turbine generator performance, actual coal cost, actual heating content of coal, and an assumed boiler efficiency of 80%. The coal cost was estimated at \$0.06 kWh. (This estimate agrees with the Department of the Army, Public Works published cost). The additional coal costs for Ft. Wainwright is:</p> <p>$(1,161,010 \text{ kWh})(\\$0.06/\text{kWh})=\\$69,660$</p> <p>The maintenance costs for the new turbine generator was obtained from the turbine generator manufacturer. In addition, maintenance costs for condenser cleaning was obtained from plant personnel. The annual maintenance cost for the plant modification is \$14,460.</p> <p>The annual electrical energy provided from GVEA to Ft. Greely was 2,713,943 kWh. The annual cost for electrical services was \$541,970. The annual savings for Ft. Greely is \$541,970 less the additional coal cost less the wheeling costs.</p> <p>The coal costs is described above. The coal costs for Ft. Wainwright to produce an additional 2,713,943 kWh previously provided by GVEA, including line losses is:</p> <p>$(1.111)(2,713,943\text{kWh})(\\$0.06/\text{kWh})=\\$180,911.$</p>		

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA	2. DATE FEB 95															
3. INSTALLATION AND LOCATION Ft. Wainwright Power Plant, Fairbanks Alaska																	
4. PROJECT TITLE Limited Energy Study, Low Pressure Turbine		5. PROJECT NUMBER															
ECONOMIC ANALYSIS (continued) <p>The 1.111 number above accounts line losses occurred when Ft. Wainwright wheels electrical energy to Ft. Greely. The cost for Ft. Wainwright to use GVEA transmission lines to wheel power to Ft. Greely is 17.64% of the energy charge calculated under the GS-2 electric rate schedule from GVEA. The total annual amount of energy measured at Ft. Greely was 16,317,360 kWh. For wheeling purposes, the amount of electrical energy Ft. Wainwright must provide to the GVEA transmission system for Ft. Greely including line losses is:</p> <p>$(1.111)(16,317,360 \text{ kWh}) = 18,128,586 \text{ kWh}.$</p> <p>The Wheeling costs is based on the GS-2 electric rate schedule from GVEA and is:</p> <table> <tr> <td>500 kWh</td> <td>@ \$0.1136</td> <td>\$57</td> </tr> <tr> <td>4500 kWh</td> <td>@ \$0.099</td> <td>\$446</td> </tr> <tr> <td>10,000 kWh</td> <td>@ \$0.0934</td> <td>\$934</td> </tr> <tr> <td>18,113,587 kWh</td> <td>@ \$0.0758</td> <td>\$1,373,009</td> </tr> <tr> <td>Total</td> <td></td> <td>\$1,374,445</td> </tr> </table> <p>Wheeling costs is $\\$1,374,445(0.1764) = \\$242,450$</p> <p>The total annual cost savings is Ft. Wainwright annual cost to GVEA plus Ft. Greely annual Cost to GVEA minus additional coal cost for Ft. Wainwright minus additional coal cost to Ft Greely minus wheeling costs minus maintenance cost:</p> <p>$\\$442,237 + \\$541,970 - \\$69,660 - \\$180,911 - \\$242,450 - \\$14,460 = \\$476,726$</p> <p>It should be noted on the attached Life Cycle Cost Analysis Summary that the annual costs to GVEA from Ft. Wainwright and Ft. Greely are broken out as electrical energy savings and demand savings.</p>			500 kWh	@ \$0.1136	\$57	4500 kWh	@ \$0.099	\$446	10,000 kWh	@ \$0.0934	\$934	18,113,587 kWh	@ \$0.0758	\$1,373,009	Total		\$1,374,445
500 kWh	@ \$0.1136	\$57															
4500 kWh	@ \$0.099	\$446															
10,000 kWh	@ \$0.0934	\$934															
18,113,587 kWh	@ \$0.0758	\$1,373,009															
Total		\$1,374,445															

1. COMPONENT ARMY	FY 1995 MILITARY CONSTRUCTION PROJECT DATA	2. DATE Feb-95
3. INSTALLATION AND LOCATION Ft Wainwright Power Plant, Fairbanks, Alaska		
4. PROJECT TITLE Limited Energy Study - Low Pressure Turbine - Alternate 1		5. PROJECT NUMBER

LIFE CYCLE COST ANALYSIS SUMMARY ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)					
LOCATION: Ft Wainwright, Fairbanks, Alaska		REGION: 4	PROJECT NO:	1406-002	
PROJECT TITLE: Limited Energy Study - Low Pressure Turbine			FISCAL YEAR:	1995	
DISCRETE PORTION NAME: TOTAL					
ANALYSIS DATE:	02/17/95	ECONOMIC LIFE:	20	PREPARED BY:	B. Ryan

1. INVESTMENT

A. CONSTRUCTION COST	=	\$2,358,017
B. SIOH COST	(8.5% of 1A) =	\$200,431
C. DESIGN COST	(6.0% of 1A) =	\$141,481
D. TOTAL COST	(1A + 1B + 1C) =	\$2,699,929
E. SALVAGE VALUE OF EXISTING EQUIPMENT	=	\$80,000
F. PUBLIC UTILITY COMPANY REBATE	=	
G. TOTAL INVESTMENT	(1D - 1E - 1F) =	-----> \$2,619,929

2. ENERGY SAVINGS (+) OR COST (-):

DATE OF NISTR-4942-1 USED FOR DISCOUNT FACTORS: <u>JAN '94</u>					
ENERGY SOURCE	FUEL COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELEC*	\$0.00	0	\$408,182	15.64	\$6,383,966
B. DIST	\$0.00	0	(\$242,450)	-	\$0
C. NAT GAS	\$0.00	0	\$0	-	\$0
D. REFUS	\$0.00	0	\$0	-	\$0
E. COAL	\$0.00	0	(\$250,571)	16.83	(\$4,217,110)
F. OTHER			\$0	-	\$0
G. DEMAND SAVINGS			\$576,025	14.74	\$8,490,609
H. TOTAL		0	\$491,186		-----> \$10,657,465
\$/MJ= \$0.00 0 =MJ/YR					

3. NON-ENERGY SAVINGS (+) OR COST (-)

A. ANNUAL RECURRING (+/-)		(\$14,460)
1 DISCOUNT FACTOR	(From Table A) =	14.74
2 DISCOUNTED SAVINGS (+) / COST (-)	(3A x 3A1) =	(\$213,140)
B. NON-RECURRING (+/-)		
ITEM	SAVINGS (+) COST(-) (1)	YEAR OF OCCURRENCE (2)
a. MAINTENANCE:		0
b. MATERIAL: NONE	\$0	0
c. MATERIAL: NONE	\$0	0
d. TOTAL	\$0	
C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)	(3A2 + 3Bd4) =	(\$213,140)

4. FIRST YEAR DOLLAR SAVINGS (+) / COSTS (-) (2H3+3A+(3Bd1/Economic Life)) \$476,726
5. SIMPLE PAYBACK (SPB) IN YEARS (MUST BE < 10 YEARS TO QUALIFY) (1G/4) = 5.50
6. TOTAL NET DISCOUNTED SAVINGS (2H5 + 3C) = \$10,444,325
7. DISCOUNTED SAVINGS-TO-INVESTMENT RATIO (SIR) (6/1 G) = 3.99

(MUST HAVE SIR > 1.25 TO QUALIFY)

**Alternative 1
Cost Estimate**

Thu 16 Feb 1995
Eff. Date 02/16/95

PROJECT FTWN-1: U.S. Army Corps of Engineers
Ft Wainwright Turbine - Alt 1 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (1)

TIME 13:56:09
TITLE PAGE 1

Ft Wainwright Turbine Generators
Low Pressure Turbine Study
Alternative 1

Designed By: BRR
Estimated By:

Prepared By: TCP

Preparation Date: 02/16/95
Effective Date of Pricing: 02/16/95
Est Construction Time: 60 Days
Sales Tax: 0.00%

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Release 5.30

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
CONTINGENCIES

PROJECT FTWN-1: U.S. Army Corps of Engineers
Ft Wainwright Turbine - Alt 1 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (1)

TIME 13:56:09
TITLE PAGE 2

Owner contingency is set at 10% for remodel work, as recommended by EN-CR
(J. Williams). Escalation rate based on mid-point of construction, which
is estimated for the summer of 1996.

0-10

LABOR ID: FBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FBK94 USB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95

U.S. Army Corps of Engineers
PROJECT FTW-1: Ft Wainwright Turbine - Alt 1 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (1)
** PROJECT INDIRECT SUMMARY - SYSTEM **

TIME 13:56:09
SUMMARY PAGE 1

	QUANTITY	UOM	DIRECT	OVERHEAD	PROFIT	BOND	TOTAL COST	UNIT COST
B Primary Facility - Alternative 1								
B.01 Fac.-Work Breakdown Structure								
B.01.09 HVAC (Turbine Generator)	1.00	MBH	1,709,497	239,330	134,469	20,833	2,104,129	2104128.63
B.01.11 Electric Power And Lighting	1.00	AMP	14,352	2,009	1,129	175	17,666	17665.60
B.01.16 Selective Building Demolition			9,033	1,265	711	110	11,118	
TOTAL Fac.-Work Breakdown Structure			1,732,882	242,604	136,309	21,118	2,132,912	
TOTAL Primary Facility - Alternative 1	1.00	EA	1,732,882	242,604	136,309	21,118	2,132,912	2132912.46
TOTAL Ft Wainwright Turbine - Alt 1	1.00	EA	1,732,882	242,604	136,309	21,118	2,132,912	2132912.46
Contingency								
							213,291	
SUBTOTAL								
							2,346,204	
Escalation to Const. Midpoint								
							11,814	
TOTAL INCL OWNER COSTS								
							2,358,017	

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

PROJECT FTWN-1: U.S. Army Corps of Engineers
Ft Walnwright Turbine - Alt 1 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (1)
B. Primary Facility - Alternative 1

TIME 13:56:09
DETAIL PAGE 1

B.01. Fac.-Work Breakdown Structure		QUANTITY	UOM	CREW ID	OUTPUT	MANHOURL	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
B. Primary Facility - Alternative 1											
B.01. Fac.-Work Breakdown Structure											
This TRACES work breakdown structure (WBS) is based on the WBS submitted on 24 April 1992 for all military construction projects. This database contains notes which pertain to each respective title level of the WBS.											
B.01.09. HVAC (Turbine Generator)											
This system includes all equipment, distribution systems, controls, and energy supply systems required by the heating, ventilating, and air conditioning system.											
B.01.09.01. Energy Supply											
The energy input to the facility (other than electrical) in the form of fuels or hot and cold water distributed from a central base facility.											
Energy received from wind or solar power is included in this subsystem.											
B.01.09.01.04. Steam Supply System (Cent Plant)											
Assemblies include meters, valves, heat exchangers, fittings, and specialties required for hook-up, and distribution piping, including supports, sleeves, and insulation. The unit of measure at the assembly level is each system.											
USR AA <	> Turbine Generator - 1, 5 MW Unit	1.00	EA	0.00	0.00	15000.00	0.00	1350000	1365000.00	1365000.00	1365000.00
	Price based on vendor cost					15,000	0	1,350,000	1,365,000		
	given for Murray #RD6M3 steam turbine generator set, 10 stage steam turbine, gearbox, 12470 V generator & switchgear. See backup data for copy of budget proposal.										
USR AA <	> Turbine Generator - 1 Condenser	1.00	EA	0.00	0.00	7200.00	0.00	205000.00	212200.00	212200.00	212200.00
	Price based on vendor cost					7,200	0	205,000	212,200		
	taken for Graham #5072/25.75 Surface Condenser. Has capacity to condense 79,561 lb/hr of saturated steam, creating 1-1/2" Hg inlet vacuum. 66F condenser water inlet, 86F condenser water outlet, with accessories.										
USR AA <	> Misc ancillary equipment	1.00	EA	0.00	0.00	2000.00	0.00	15000.00	17000.00	17000.00	17000.00
	Includes miscellaneous pumps, bearing lubrication system, bearing cooling system, and misc. gauges & instrumentation.					2,000	0	15,000	17,000		
TOTAL Steam Supply System (Cent Plant)											
		1.00	MBH	0	0	24,200	0	1,570,000	1,594,200	1,594,200.00	1594200.00
TOTAL Energy Supply											
		1.00	MBH	0	0	24,200	0	1,570,000	1,594,200	1,594,200.00	1594200.00

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

PROJECT FTWN-1: U.S. Army Corps of Engineers
Ft Walwright Turbine - Alt 1 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (1)
B. Primary Facility - Alternative 1

B.01. Fac.-Work Breakdown Structure	QUANTITY UOM CREW ID	OUTPUT MANHOUR	LABOR EQUIPMENT MATERIAL	TOTAL COST	UNIT COST
B.01.09.04. Distribution Systems					
This includes systems that distribute heated and cooled air, ventilating and exhaust air, hot and chilled water, steam, and glycol heating.					
B.01.09.04.02. Steam Distribution Systems					
Assemblies include pipe and fitting, including supports, wall and floor sleeves, and pipe insulation. The unit of measure at the assembly level is MBE.					
USR AA < > 10" Control Valve, 400 psi stem Steam control valve price based on Means cost data.	1.00 EA MPLUJ	0.24	14.89 599.88 6	18000.00 18,606	18606.11
<15061 0000 Steel Pipe>					
<15061 1300 Galvanized Pipe (Astm A-53) And Fittings, T And<					
<C Sch 40 Note - Price Does Not Include Hangers Or Fittings>					
<15061 2300 Black Pipe (Astm A-53) And Fittings>					
<15061 2300 Basic Cost Items>					
M MIL AA <15061 2302 > 3"(80mm)Black Pipe, PE Sch 40 A53 Condensate piping	120.00 LF MSPFE	15.00	0.17 6.94 20 833	2.83 340	10.02
M MIL AA <15061 2307 > 10"(25cm)Black Pipe, PE Sch 40 A53 400 paig Stem piping	20.00 LF MSPFE	6.50	0.50 19.96 10 399	11.99 240	33.19
M MIL AA <15061 2311 > 16"(41cm)Black Pipe, PE Sch 40 A53 100 paig extraction piping	20.00 LF MSPFE	3.25	1.00 39.93 20 799	26.80 536	69.20
M MIL AA <15061 2311 > 16"(41cm)Black Pipe, PE Sch 40 A53 Condenser cooling water piping	200.00 LF MSPFE	3.25	1.00 39.93 200 7,985	26.80 5,360	69.20
M MIL AA <15061 2314 > 24"(61cm)Black Pipe, PE Sch 40 A53 Vent piping	20.00 LF MSPFE	1.88	1.73 69.20 35 1,384	113.15 2,263	113.15
<15101 0000 Gate Valves>					
<15101 1100 Bronze - For Threaded, Brazed Or Soldered>					
<Installation - 125Lb>					
<15101 1600 Iron Body - Bronze Mounted Flanged Valves - Osg>					
<Y - 125 Lb>					
<15101 1600 Basic Cost Items>					
M MIL AA <15101 1609 > 10"Iron Body, Brz Mtd,Gate Valve 125# Flanged Isolation valve, modified for 250 lb rating. <*Mod* 1622 > For 250 Lb Add To Material	1.00 EA MPLUJ	0.50	7.00 282.06 7 282	1591.92 531	1876.91
M CIV AA <15101 1613 > 16"Iron Body, Brz Mtd,Gate Valve 125# Flanged Isolation valve, modified for 300 lb rating <*Mod* > For 250 lb rated valve	3.00 EA MPLUN	0.25	10.80 448.98 32 1,347	9615.84 9,616	10101.19

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

PROJECT FTW-1: U.S. Army Corps of Engineers
Ft Wainwright Turbine - Alt 1 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (1)
B. Primary Facility - Alternative 1

TIME 13:56:09
DETAIL PAGE 3

B.01. Pac.-Work Breakdown Structure		QUANTITY	UOM	CREW	ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
<15111 0000 Swing Check Valves>												
<15111 1100 Bronze - For Threaded, Braised Or Soldered>												
<Installation--125 Lb>												
<15111 1200 Iron Body - Bronze Mounted Flanged - 125 Lb>												
<15111 1200 Basic Cost Items>												
M CIV AA <15111 1215 > 16"IB Swing Ck Vlv,Brs,Flgt125#												
Mon return valve, modified for		1.00	EA	MPLUN		0.25	11	449	36.37	25863.08	26348.43	
300 lb rating. Price was									36	12,932	26,348	
compared to Means Cost Data.												
<*Mod* 1221 > For 250 Lb (113Kg) Rated Valves										12,932		
<15050 0000 Basic Materials And Methods>												
<15141 0000 Centrifugal Pumps>												
<15141 3000 Cast Iron Two Stage, Horizontal Split Case, 125>												
<Lb Flanged, 3500 Rpm Drip-Proof Motor, Common Base Plate 500 Ft Head.>												
<Packed Stuffing Box And Boiler Feed Water Service>												
M MIL AA <15141 3001 > 100GPM CI Cntrf Pump,1-1/2"Disch												
Two Stage, Hots Split Case,10		2.00	EA	MSPTPS		0.16	31	1,278	6.40	3759.50	4404.88	
HP									13	7,519	8,810	
Condensate pump												4404.88
TOTAL Steam Distribution Systems		1.00	MEH				380	15,356	851	89,090	105,297	105297.05
TOTAL Distribution Systems		1.00	MEH				380	15,356	851	89,090	105,297	105297.05

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPS ID: ANCH94

0-14

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

U.S. Army Corps of Engineers
PROJECT FTWN-1: Ft Wainwright Turbine - Alt 1 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (1)
B. Primary Facility - Alternative 1

TIME 13:56:09
DETAIL PAGE 4

B.01. Fac.-Work Breakdown Structure		QUANTITY	UOM	CREW ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
B.01.09.07. Systems Testing and Balancing											
This includes operation of all systems to determine capacity and adjustment of water and hot water systems, air flow of air handling units, supply and exhaust fans and supply, and return and exhaust registers.											
B.01.09.07.04. Turbine Startup Services											
USR AA <											
> Turbine Gen Startup Services		1.00	EA		0.00	0	10,000.00	0.00	0.00	10,000.00	10000.00
TOTAL Turbine Startup Services					0.00	0	10,000	0	0	10,000	
TOTAL Systems Testing and Balancing		1.00	MBH				10,000	0	0	10,000	10000.00
TOTAL HVAC (Turbine Generator)		1.00	MBH			380	49,556	851	1,659,090	1,709,497	1709497.05

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UFB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

U.S. Army Corps of Engineers
PROJECT FTWN-1: Ft Wainwright Turbine - Alt 1 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (1)
B. Primary Facility - Alternative 1

TIME 13:56:09
DETAIL PAGE 5

B.01. Fac.-Work Breakdown Structure		QUANTITY	UOM	CREW ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
B.01.11. Electric Power And Lighting											
B.01.11.01. Service and Distribution											
B.01.11.01.08. Turbine Generator - Electrical											
USR AA < > Testing		1.00	EA	EXLES	0.02	114.16	5005.81	15.23	0.00	5021.04	5021.04
<16050 0000 Basic Materials And Methods>											
<16120 0000 Wire And Cable>											
<Note - 1. Based On 100 Ft (30M) Run 2. Pulled In Conduit, Except As>											
<Noted 3. Max.Height Up To 12 Ft (3.7M) 4. Working Foreman, Unloading,>											
<Handling, Pull Wires, Pulling Branch Circuit Conductors Testing,>											
<Splicing, Cleanup, New Work Only 5. All Conductors Are Copper, except>											
<as otherwise noted. No Special Set Up Required>											
<16120 3000 15 Kv Cable>											
<16120 3300 Shielded, Xlp Insulated, 15 Kv, Single>											
<Conductor Installed On Poles, Aerially 133 Pct Insulation>											
M MIL AA <16120 3307 > 350 MCM Cable,XLP,15KV,on Poles						40.46	1658.39	213.39	3547.50	5419.29	
Shielded,Single Cndct,133% Insul		1.00	MLF	EXLEK	0.17	40	1,658	213	3,548	5,419	5419.29
<16050 0000 Basic Materials And Methods>											
<16121 0000 Wire Connections And Devices>											
<16121 3000 15KV>											
<16121 3600 Cable Termination>											
M MIL AA <16121 3603 > 350 MCM-500 MCM Cable Terminatio						3.88	169.96	0.52	156.44	326.92	
15 KV		6.00	EA	EXLES	0.65	23	1,020	3	939	1,962	326.92
TOTAL Turbine Generator - Electrical		1.00	AMP			178	7,684	232	4,486	12,402	12401.86

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

U.S. Army Corps of Engineers
PROJECT FTWN-1: Ft Wainwright Turbine - Alt 1 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (1)
B. Primary Facility - Alternative 1

TIME 13:56:09
DETAIL PAGE 6

B.01. Fac.-Work Breakdown Structure		QUANTITY	UOM	CREW ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
B.01.11.01.09. Pump Motor - Electrical											
<16050 0000 Basic Materials And Methods>											
<16120 0000 Wire And Cable>											
<Note - 1. Based On 100 Ft (30M) Run 2. Pulled In Conduit, Except As>											
<Noted 3. Max.Height Up To 12 Ft (3.7M) 4. Working Foreman, Unloading,>											
<Handling, Pull Wires, Pulling Branch Circuit Conductors, Testing,>											
<Splicing, Cleanup, New Work Only 5. All Conductors Are Copper, except>											
<as otherwise noted. No Special Set Up Required>											
<16120 1000 600 Volt Branch Wire>											
<16120 1500 600 Volt, Feeder Wire, Single Stranded>											
<Conductor Note - Pulled In Conduit>											
B MIL AA <16120 1508 > #3/0 AWG Cable-Type THW											
600V Cu, Sgl Strd, Pl in											
Cnd, 12' Hg											
Condensate pump motor feeder											
wire											
B MIL AA <16120 1508 > #3/0 AWG Cable-Type THW											
600V Cu, Sgl Strd, Pl in											
Cnd, 12' Hg											
Condensate pump motor feeder											
wire											
<16050 0000 Basic Materials And Methods>											
<16121 0000 Wire Connections And Devices>											
<16121 1000 Low Voltage - To 600 Volts>											
<16121 1400 Cable Termination Lugs Handwrapped, No Stress>											
<Cone>											
M MIL AA <16121 1404 > #4/0 AWG Cable Term Lugs, wrapped											
No Stress Cones, Low Volt To 600V											
<16155 0000 Motor Starters>											
<16155 2000 Magnetic Motor Starters>											
<16155 2100 120 - 600 Volt, 3 Phase, 3 Wire, 60 Hz - Non->											
<Reversing>											
<16155 2120 Name 4 Enclosure>											
M MIL AA <16155 2123 > Mag Str, Size 2, NEMA 4, 3P, N-Rev											
208V/10HP, 230V/15HP, 480V/25HP											
Condensate pumps											
TOTAL Pump Motor - Electrical											
TOTAL Service and Distribution											
TOTAL Electric Power And Lighting											

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

PROJECT FTWN-1: U.S. Army Corps of Engineers
Ft Wainwright Turbine - Alt 1 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (1)
B. Primary Facility - Alternative 1

TIME 13:56:09
DETAIL PAGE 7

B.01. Fac.-Work Breakdown Structure		QUANTITY	UOM	CREW ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
B.01.16. Selective Building Demolition											
B.01.16.01. Non-Hazardous Selective Building Demolition											
B.01.16.01.06. Mechanical Systems											
USR AA < > Demo Existing Turbine Gen - 1		1.00	EA		0.00	320.00	8,192.00	0.00	0.00	8,192.00	8,192.00
<02110 0000 Demolition>											
<02111 0000 Building Demolition - Interior>											
<02111 9000 Plumbing And Rvac Demolition>											
<02111 9200 Piping, Metal>											
CIV AA <02111 9203 > Demo Metal STM Pipe 10"D-400 psi		20.00	LF	MPLUB	12.50	0.20	8.33	0.08	0.00	8.41	8.41
CIV AA <02111 9204 > Demo Metal Extraction Pipe - 16"		20.00	LF	MPLUB	6.25	0.40	16.66	0.16	0.00	16.82	16.82
CIV AA <02111 9204 > Demo Metal Vent Pipe - 24"D		20.00	LF	MPLUB	6.25	0.40	16.66	0.16	0.00	16.82	16.82
TOTAL Mechanical systems						340	9,025	8	0	9,033	
TOTAL Non-Hazardous Selective Building						340	9,025	8	0	9,033	
TOTAL Selective Building Demolition						340	9,025	8	0	9,033	
TOTAL Fac.-Work Breakdown Structure						923	67,332	1,094	1,664,457	1,732,882	
TOTAL Primary Facility - Alternative 1		1.00	EA			923	67,332	1,094	1,664,457	1,732,882	1732882.44
TOTAL Ft Wainwright Turbine - Alt 1		1.00	EA			923	67,332	1,094	1,664,457	1,732,882	1732882.44

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95

U.S. Army Corps of Engineers
PROJECT FTWN-1: Ft Mainwright Turbine - Alt 1
LIMITED TURBINE STUDY

TIME 16:27:35
SETTINGS PAGE 5

** OWNER, OVERTIME, AND ADJUSTMENTS SETTINGS **

AMOUNT	PERCENT	BEGIN	END	ESCALATN INDEX
--------	---------	-------	-----	----------------

Project Information Record
Contingency
Escalation to Const. Midpoint

P	10.00	07/96	09/96	1986	1996
C	0.50				

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95

U.S. Army Corps of Engineers
PROJECT FTWN-1: Ft Wainwright Turbine - Alt 1
LIMITED TURBINE STUDY

TIME 16127135
SETTINGS PAGE 6

** CONTRACTOR SETTINGS **

		AMOUNT	PCT	PCT S	RISK	DIFF	SIZE	PERIOD	INVEST	ASSIST	SUBCON
--	--	--------	-----	-------	------	------	------	--------	--------	--------	--------

AA General Contractor

Overhead	P	14.00									
Profit	C	6.90			0.050	0.075	0.085	0.040	0.040	0.040	0.100
Bond	P	1.00									

C-20

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95

U.S. Army Corps of Engineers
PROJECT FTWN-1: Ft Mainwright Turbine - Alt 1
LIMITED TURBINE STUDY

TIME 16:27:35
SETTINGS PAGE 7

*** PROFIT WEIGHTED GUIDELINES ***

PROJECT: Ft Mainwright Turbine - Alt 1 ESTIMATED BY
Low Pressure Turbine Study CHECKED BY: TCP
Alternative 1 DATE: 08/01/96

PROFIT OBJECTIVE FOR: AA General Contractor

FACTOR	RATE (%)	WEIGHT	VALUE
		(0.03 - 0.12)	
1. Degree of Risk	20	x 0.050	1.000%
2. Difficulty of Work	15	x 0.075	1.125%
3. Size of Job	15	x 0.085	1.275%
4. Period of Performance	15	x 0.040	0.600%
5. Contractor's Investment	5	x 0.040	0.200%
6. Assistance by Government	5	x 0.040	0.200%
7. Subcontracting	25	x 0.100	2.500%
	100	PROFIT FACTOR:	6.900%

COMMENTS (Reasons for Weights Assigned):

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

**Alternative 2
Cost Estimate**

Thu 16 Feb 1995
Eff. Date 02/16/95

PROJECT FTWN-2: U.S. Army Corps of Engineers
Ft Wainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)

TIME 13:57:13
TITLE PAGE 1

Ft Wainwright Turbine Generators
Low Pressure Turbine Study
Alternative 2

Designed By: BRR
Estimated By:

Prepared By: TCP

Preparation Date: 02/16/95
Effective Date of Pricing: 02/16/95
Est Construction Time: 60 Days

Sales Tax: 0.00%

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LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
CONTINGENCIES

PROJECT FTWN-2: U.S. Army Corps of Engineers
Pt Wainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)

TIME 13:57:13
TITLE PAGE 2

Owner contingency is set at 20% for remodel work, due to extensive nature of remodel work as well as preliminary nature of study cost estimate. Escalation rate based on mid-point of construction, which is estimated for the summer of 1996.

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

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U.S. Army Corps of Engineers
PROJECT FTWN-2: Ft Wainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)
** PROJECT INDIRECT SUMMARY - SYSTEM **

TIME 13:57:13
SUMMARY PAGE 1

	QUANTITY	UOM	DIRECT	OVERHEAD	PROFIT	BOND	TOTAL COST	UNIT COST
B Primary Facility - Alternative 2								
B.01 Fac.-Work Breakdown Structure								
B.01.01 Substructure	1.00	SF	14,850	2,079	1,168	181	18,278	18278.07
B.01.09 HVAC	1.00	MBH	1,413,354	197,870	111,174	17,224	1,739,622	1739622.07
B.01.11 Electric Power And Lighting	1.00	AMP	91,344	12,788	7,185	1,113	112,430	112430.18
B.01.16 Selective Building Demolition			6,347	889	499	77	7,812	
TOTAL Fac.-Work Breakdown Structure			1,525,895	213,625	120,027	18,595	1,878,142	
TOTAL Primary Facility - Alternative 2	1.00	EA	1,525,895	213,625	120,027	18,595	1,878,142	1878142.39
TOTAL Ft Wainwright Turbine - Alt 2	1.00	EA	1,525,895	213,625	120,027	18,595	1,878,142	1878142.39
Contingency							375,628	
SUBTOTAL							2,253,771	
Escalation to Const. Midpoint							11,348	
TOTAL INCL OWNER COSTS							2,265,119	

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

U.S. Army Corps of Engineers
PROJECT FTWN-2: Ft Mainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)
B. Primary Facility - Alternative 2

TIME 13:57:13
DETAIL PAGE 1

B.01. Fac.-Work Breakdown Structure									
QUANTITY	UOM	CREW ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
B. Primary Facility - Alternative 2									
B.01. Fac.-Work Breakdown Structure									
B.01.01. Substructure									
This system includes all work below the lowest floor construction (usually slab on grade) and the enclosing horizontal and vertical elements required to form a basement, together with the necessary mass excavation and backfill.									
B.01.01.02. Special Foundation Conditions									
All work associated with special foundations including piles, caissons, and any other special foundation situation.									
B.01.01.02.07. Special Turbine Gen. Foundation									
USR AA <									
> Turbine Generator Foundation									
Cost based on historical cost									
data from construction cost of									
previous 5 MW turbine									
generator.									
54.00	CY		0.00	0	23.00	0.00	252.00	275.00	275.00
					1,242	0	13,608	14,850	
TOTAL Special Turbine Gen. Foundation									
1.00	SF		0	0	1,242	0	13,608	14,850	14850.00
TOTAL Special Foundation Conditions									
1.00	SF		0	0	1,242	0	13,608	14,850	14850.00
TOTAL Substructure									
1.00	SF		0	0	1,242	0	13,608	14,850	14850.00

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

PROJECT FTWN-2: U.S. Army Corps of Engineers
Ft Walnwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)
B. Primary Facility - Alternative 2

TIME 13:57:13
DETAIL PAGE 2

B.01. Pac.-Work Breakdown Structure		QUANTITY	UOM	CREW	ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
B.01.09. HVAC												
This system includes all equipment, distribution systems, controls, and energy supply systems required by the heating, ventilating, and air conditioning system.												
B.01.09.01. Energy Supply												
The energy input to the facility (other than electrical) in the form of fuels or hot and cold water distributed from a central base facility.												
Energy received from wind or solar power is included in this subsystem.												
B.01.09.01.04. Steam Supply System (Cent Plant)												
Assemblies include meters, valves, heat exchangers, fittings, and specialties required for hook-up, and distribution piping, including supports, sleeves, and insulation. The unit of measure at the assembly level is each system.												
USR AA <	> Turbine Generator, 2.9 MW Unit	1.00	EA	0.00	0.00	15000.00	0.00	1080000	1095000.00	0.00	1095000.00	1095000.00
Price based on vendor cost given for Bwing #C-I-30 steam turbine generator set, 4 stage steam turbine, utilizing 79561 lb/hr steam, 24" inlet, 48" outlet, Murray frame M4. See backup data for copy of budget proposal.												
USR AA <	> Turbine Generator - 1 Condenser	1.00	EA	0.00	0.00	7200.00	0.00	197000.00	204200.00	0.00	204200.00	204200.00
Price based on vendor cost taken for Graham #5066/25.75 Surface Condenser. Has capacity to condense 79,561 lb/hr of saturated steam, with accessories.												
USR AA <	> Misc ancillary equipment	1.00	EA	0.00	0.00	2000.00	0.00	15000.00	17000.00	0.00	17000.00	17000.00
Includes miscellaneous pumps, bearing lubrication system, bearing cooling system, and misc. gauges & instrumentation.												
TOTAL Steam Supply System (Cent Plant)		1.00	MBH	0	0	24,200	0	1,292,000	1,316,200	0	1,316,200	1316200.00
TOTAL Energy Supply		1.00	MBH	0	0	24,200	0	1,292,000	1,316,200	0	1,316,200	1316200.00

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

PROJECT FTWN-2: U.S. Army Corps of Engineers
Ft Wainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)
B. Primary Facility - Alternative 2

TIME 13:57:13
DETAIL PAGE 3

B.01. Fac.-Work Breakdown Structure										QUANTITY	UOM	CREW	ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST	
B.01.09.04. Distribution Systems																					
This includes systems that distribute heated and cooled air, ventilating and exhaust air, hot and chilled water, steam, and glycol heating.																					
B.01.09.04.02. Steam Distribution Systems																					
Assemblies include pipe and fitting, including supports, wall and floor sleeves, and pipe insulation. The unit of measure at the assembly level is MBH.																					
USR AA < > 16" Control Valve, 400 psi steam control valve price based on Means cost data.										1.00	EA	MPLUJ		0.18	19.85	799.95	8.31	24000.00	24808.26	24808.26	
<15061 0000 Steel Pipe>																					
<15061 1300 Galvanized Pipe (Astm A-53) And Fittings, T And>																					
<C Sch 40 Note - Price Does Not Include Hangers Or Fittings>																					
<15061 2300 Black Pipe (Astm A-53) And Fittings>																					
<15061 2300 Basic Cost Items>																					
M MIL AA <15061 2302 > 3"(80mm)Black Pipe, PE Sch 40 A53										120.00	LF	MSPFH		15.00	0.17	6.94	0.24	2.83	10.02	10.02	
Condensate piping															20	833	29	340	1,202	10.02	
M MIL AA <15061 2307 > 10"(25cm)Black Pipe, PE Sch40 A53										80.00	LF	MSPFH		6.50	0.50	19.96	1.24	11.99	33.19	33.19	
400 psig 8cm piping															40	1,597	99	959	2,655	33.19	
M MIL AA <15061 2311 > 16"(41cm)Black Pipe, PE Sch40 A53										80.00	LF	MSPFH		3.25	1.00	39.93	2.47	26.80	69.20	69.20	
100 psig extraction piping															80	3,194	198	2,144	5,536	69.20	
M MIL AA <15061 2311 > 16"(41cm)Black Pipe, PE Sch40 A53										200.00	LF	MSPFH		3.25	1.00	39.93	2.47	26.80	69.20	69.20	
Condenser cooling water piping															200	7,985	495	5,360	13,840	69.20	
<15101 0000 Gate Valves>																					
<15101 1100 Bronze - For Threaded, Braised Or Soldered>																					
<Installation - 125Lb>																					
<15101 1600 Iron Body - Bronze Mounted Flanged Valves - Osk>																					
<Y - 125 Lb>																					
<15101 1600 Basic Cost Items>																					
M CIV AA <15101 1613 > 16" Iron Body, Brz Mtd, Gate Valve										3.00	EA	MPLUN		0.25	10.80	448.98	36.37	9615.84	10101.19	10101.19	
125# Flanged															32	1,347	109	9,616	30,304	10101.19	
Isolation valve, modified for																					
300 lb rating																					
<"Mod" > For 250 lb rated valve																					
<15050 0000 Basic Materials And Methods>																					
<15141 0000 Centrifugal Pumps>																					

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPS ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

U.S. Army Corps of Engineers
PROJECT FTWN-2: Ft Wainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)
B. Primary Facility - Alternative 2

TIME 13:57:13
DETAIL PAGE 4

B.01. Fac.-Work Breakdown Structure		QUANTITY	UOM	CREW ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
<15141 3000 Cast Iron Two Stage, Horizontal Split Case, 125> <1b Flanged, 3500 Rpm Drip-Proof Motor, Common Base Plate 500 Ft Head.> <Packed Stuffing Box And Boiler Feed Water Service>											
M MIL AA <15141 3001 > 100GPM CI Cntrf Pump, 1-1/2" Disch											
Two Stage, Horiz Split Case, 10		15.34	EA	MSPPB	0.16	31	638.97	6.40	3759.50	4404.88	
Condensate pump							1,278	13	7,519	8,810	4404.88
TOTAL Steam Distribution Systems		423					17,034	951	69,169	87,154	87154.08
TOTAL Distribution Systems		423					17,034	951	69,169	87,154	87154.08

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCE94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

PROJECT FTWN-2: U.S. Army Corps of Engineers
Ft Wainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)
B. Primary Facility - Alternative 2

TIME 13:57:13
DETAIL PAGE 5

B.01. Fac.-Work Breakdown Structure

B.01.09.07. Systems Testing and Balancing
This includes operation of all systems to determine capacity and adjustment
of water and hot water systems, air flow of air handling units, supply and
exhaust fans and supply, and return and exhaust registers.
B.01.09.07.04. Turbine Startup Services

QUANTITY	UOM	CREW ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
1.00	EA		0.00	0	10,000.00	0.00	0	10,000.00	10000.00
				0	10,000	0	0	10,000	
TOTAL Turbine Startup Services									
1.00	MHH			0	10,000	0	0	10,000	10000.00
TOTAL Systems Testing and Balancing									
1.00	MHH			423	51,234	951	1,361,169	1,413,354	1413354.08
TOTAL HVAC									

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UFB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

PROJECT FTWN-2: U.S. Army Corps of Engineers
Ft Wainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)
B. Primary Facility - Alternative 2

TIME 13:57:13
DETAIL PAGE 6

B.01. Fac.-Work Breakdown Structure														UNIT COST
B.01.11. Electric Power And Lighting														
B.01.11.01. Service and Distribution														
B.01.11.01.08. Turbine Generator - Electrical														
USR AA <	> 15 KV Breaker, 1200 amp	1.00 EA	EELEG	0.07	90.23	3748.30	0.00	28200.00	31948.30					31948.30
	Cost taken from Richardson Cost					3,748	0	28,200	31,948					
	Data, 1994.													
USR AA <	> Relays	1.00 EA	EELEG	0.12	48.15	2000.50	0.00	41700.00	43700.50					43700.50
	Cost taken from Richardson Cost					2,000	0	41,700	43,700					
	Data, 1994.													
USR AA <	> Grounding Reactor	1.00 EA	EELEG	0.50	12.04	500.02	0.00	4000.00	4500.02					4500.02
	Cost taken from Richardson Cost					500	0	4,000	4,500					
	Data, 1994.													
USR AA <	> Testing	1.00 EA	EELEB	0.02	113.64	4983.06	15.16	0.00	4998.22					4998.22
						114	15	0	4,998					
<16050 0000 Basic Materials And Methods>														
<16120 0000 Wire And Cable>														
<Note - 1. Based On 100 Ft (30M) Run 2. Pulled In Conduit, Except As>														
<Noted 3. Max.Height Up To 12 Ft (3.7M) 4. Working Foreman, Unloading,>														
<Handling, Pull Wires, Pulling Branch Circuit Conductors Testing,>														
<Splicing, Cleanup, New Work Only 5. All Conductors Are Copper, except>														
<as otherwise noted. No Special Set Up Required>														
<16120 3000 15 Kv Cable>														
<16120 3300 Shielded, Xlp Insulated, 15 Kv, Single>														
<Conductor Installed On Poles, Aerially 133 Pct Insulation>														
M MIL AA <16120 3302 >	#1/0 AWG Ca,XLP,15KV, on Poles	1.00 MLP	EELEK	0.37	19.18	786.03	101.14	1397.50	2284.68					2284.68
	Shielded,Single Cndct,133% Insl				19	786	101	1,398	2,285					
<16050 0000 Basic Materials And Methods>														
<16121 0000 Wire Connections And Devices>														
<16121 3000 15Kv>														
<16121 3600 Cable Termination>														
M MIL AA <16121 3603 >	350 MCM-500 MCM Cable Terminatio	6.00 EA	EELEB	0.65	3.88	169.96	0.52	156.44	326.92					326.92
	15 KV				23	1,020	3	939	1,962					
TOTAL Turbine Generator - Electrical														
		1.00 AMP			306	13,038	119	76,236	89,393					89393.24

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

PROJECT FTNN-2: U.S. Army Corps of Engineers
Ft Wainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)
B. Primary Facility - Alternative 2

TIME 13:57:13
DETAIL PAGE 7

B.01. Fac.-Work Breakdown Structure		QUANTITY	UOM	CREW ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
B.01.11.01.09. Pump Motor - Electrical											
<16050 0000 Basic Materials And Methods>											
<16120 0000 Wire And Cable>											
<Note - 1. Based On 100 Ft (30M) Run 2. Pulled In Conduit, Except As>											
<Noted 3. Max.Height Up To 12 Ft (3.7M) 4. Working Foreman, Unloading,>											
<Handling, Pull Wires, Pulling Branch Circuit Conductors, Testing,>											
<Splicing, Cleanup, New Work Only 5. All Conductors Are Copper, except>											
<as otherwise noted, No Special Set Up Required>											
<16120 1000 600 Volt Branch Wire>											
<16120 1500 600 Volt, Feeder Wire, Single Stranded>											
<Conductor Note - Pulled In Conduit>											
B MIL AA <16120 1508 > #3/0 AWG Cable-Type THW											
600V Cu,8gl Strd,Pl in											
Cnd,12'Hg											
Condensate pump motor feeder											
wire											
<16050 0000 Basic Materials And Methods>											
<16121 0000 Wire Connections And Devices>											
<16121 1000 Low Voltage - To 600 Volts>											
<16121 1400 Cable Termination Lugs Handwrapped, No Stress>											
<Cone>											
M MIL AA <16121 1404 > #4/0 AWG Cable Term Lugs,wrapped											
No Stress Cones,Low Volt To 600V											
<16155 0000 Motor Starters>											
<16155 2000 Magnetic Motor Starters>											
<16155 2100 120 - 600 Volt, 3 Phase, 3 Wire, 60 Hz - Non->											
<Reversing>											
<16155 2120 Nema 4 Enclosure>											
M MIL AA <16155 2123 > Mag Str,Size 2,NEMA 4,3P,N-Rev											
208VØ1ØHP,23ØVØ15HP,48ØVØ25HP											
Condensate pumps											
TOTAL Pump Motor - Electrical											
TOTAL Service and Distribution											
TOTAL Electric Power And Lighting											

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPS ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

PROJECT FTWN-2: U.S. Army Corps of Engineers
Ft Wainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)
B. Primary Facility - Alternative 2

TIME 13:57:13
DETAIL PAGE 8

B.01. Fac.-Work Breakdown Structure	QUANTITY	UOM	CREW ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
B.01.16. Selective Building Demolition										
B.01.16.01. Non-Hazardous Selective Building Demolition										
B.01.16.01.01. Substructure & Superstructure										
<02000 0000 Site Work>										
<02110 0000 Demolition>										
<02112 0000 Selective Demolition>										
<02112 2000 Building Foundations>										
<Note - Price Based On Cubic Meters Of Material>										
MIL AA <02112 2003 > Demo Reinf Conc Bldg Foundation	720.00	CF	CLADD	84.38	0.07	2.68	1.30	0.00	3.97	3.97
					51	1,928	932	0	2,861	
<02112 0000 Selective Demolition>										
<02112 6000 Saw Or Torch Cutting>										
<Per Linear Inch Of Depth>										
MIL AA <02112 6005 > Saw Cut Mesh Reinf Concrete Slab	300.00	LF	ULABE	33.75	0.04	1.37	0.04	0.00	1.41	1.41
Per Inch of Depth					11	411	13	0	424	
TOTAL Substructure & Superstructure					62	2,339	945	0	3,284	

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

PROJECT FTWN-2: U.S. Army Corps of Engineers
Ft Wainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)
B. Primary Facility - Alternative 2

TIME 13:57:13
DETAIL PAGE 9

B.01. Pac.-Work Breakdown Structure		QUANTITY	UOM	CREW	ID	OUTPUT	MANHOUR	LABOR	EQUIPMENT	MATERIAL	TOTAL COST	UNIT COST
B.01.16.01.04. Interior Construction & Finishes												
<02110 0000 Demolition>												
<02111 0000 Building Demolition - Interior>												
<02111 3000 Partition Removal>												
<Note - Price Includes Knock Down>												
<02111 3500 Stud Partitions>												
MIL AA <02111 3501 > Demo Drywall & Stud Partition												
Mtl/Wood Stud w/Drywall 2 Sides		500.00	SF	ULABF		65.00	0.05	1.99	0.60	0.00	2.59	
							27	995	302	0	1,297	2.59
TOTAL Interior Construction & Finishes							27	995	302	0	1,297	

LABOR ID: FRBK94

Currency in DOLLARS

CREW ID: FRBK94

UPB ID: ANCH94

Thu 16 Feb 1995
Eff. Date 02/16/95
DETAILED ESTIMATE

U.S. Army Corps of Engineers
PROJECT FTWN-2: Ft Wainwright Turbine - Alt 2 - Low Pressure Turbine Study
LIMITED TURBINE STUDY, INTERIM SUBMITTAL (2)
B. Primary Facility - Alternative 2

TIME 13:57:13
DETAIL PAGE 10

B.01. Fac.-Work Breakdown Structure											UNIT COST
B.01.16.01.06. Mechanical Systems											
<02110 0000 Demolition>											
<02111 0000 Building Demolition - Interior>											
<02111 9000 Plumbing And Hvac Demolition>											
<02111 9200 Piping, Metal>											
CIV AA <02111 9203 > Demo Metal 8tm Pipe 10"D-400 psi	50.00	LF	MFLUB	12.50	0.20	8.33	0.08	0.00	8.41	8.41	
					10	417	4	0	420		
CIV AA <02111 9204 > Demo Metal Extraction Pipe - 16"	50.00	LF	MFLUB	6.25	0.40	16.66	0.16	0.00	16.82	16.82	
					20	833	8	0	841		
CIV AA <02111 9204 > Demo Metal Vent Pipe - 24"D	30.00	LF	MFLUB	6.25	0.40	16.66	0.16	0.00	16.82	16.82	
					12	500	5	0	505		
TOTAL Mechanical Systems					42	1,750	16	0	1,766		
TOTAL Non-Hazardous Selective Building											
	131				5,084	1,263	0	0	6,347		
TOTAL Selective Building Demolition											
	131				5,084	1,263	0	0	6,347		
TOTAL Fac.-Work Breakdown Structure											
	885				71,664	2,337	1,451,894	1,525,895			
TOTAL Primary Facility - Alternative 2											
	885				71,664	2,337	1,451,894	1,525,895	1525894.77		
TOTAL Ft Wainwright Turbine - Alt 2											
	885				71,664	2,337	1,451,894	1,525,895	1525894.77		

LABOR ID: FRBK94 EQUIP ID: ALASKA

Currency in DOLLARS

CREW ID: FRBK94 UPS ID: ANCH94

APPENDIX D
EQUIPMENT DATA

Alternative 1 Equipment

**FRY EQUIPMENT CO., INC.**

2600 W. 2ND AVENUE SUITE 7 DENVER, COLORADO 80219 PHONE 303-922-8442

FAX: (303) 922-8445

DATE: 18 NOV 94TRANSMITTED TO: EMCATTENTION: BRAD RYAN FROM: LOW GROUNDSUBJECT: FT. WAINWRIGHT, ALASKAThis Transmission Consists of 2 Pages Including This Page.

BRAD:

MURRAY IS UNABLE TO DO $1\frac{1}{2}$ " Hg, Reason:
TO CLOSE TO A PERFECT VACUUM, THE TURBINE
WOULD BE EXTREMELY EXPENSIVE AND REQUIRE
ADDITIONAL EQUIPMENT. AT $2\frac{1}{2}$ " Hg THE
ATTACHED PROPOSAL WILL PRODUCE MORE THAN YOUR
REQUIRED OUTPUT.

ALTERNATIVE 1

QTY - 1 MURRAY # RJDGM3 STEAM TURBINE
GENERATOR SET. 400 PSIG \rightarrow 2.5" Hg
10 STAGE STEAM TURBINE, GEARBOX,
12,470 VOLT GENERATOR AND SWITCHGEAR
MAXIMUM 6690 K.W OUTPUT \rightarrow 6125 K.W
OUTPUT WITH EXTRACTION

PRICE: \$ 1,350,000


**TUTHILL
CORPORATION**
**Murray Turbomachinery
Division**

 1106 Washington Street, P.O. Box 867
 Burlington, Iowa USA 52601-0967
 Tel 319 753-8431 Fax 319 752-1616

STEAM TURBINE-GENERATOR BUDGET PROPOSAL

 TO: Fry Equipment

 ATTN: Lou Grounds

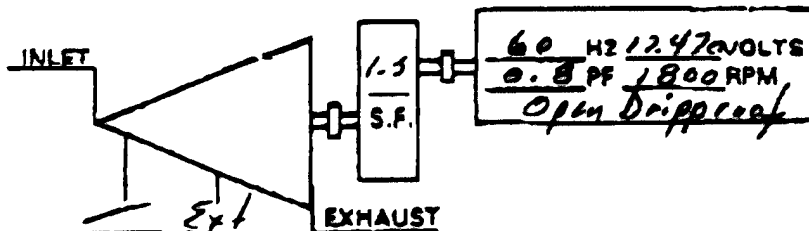
TELEFAX NUMBER:

 DATE: Nov 18 '94

 SUBJECT: Ft Wainwright - Alaska

 MURRAY REF: J16518

 SIGNED: Judi Engler (FME Engr)

 SHEET: 1 OF 1


TURBINE DATA/SELECTION	E			
FRAME	<u>RJD6M3</u>			
NUMBER OF STAGES	<u>10</u>			
INLET VALVES	<u>Multiple</u>			
INLET SIZE/RATING	<u>8" 600#</u>			
EXT./IND. SIZE/RATING	<u>10" 300#</u>			
BLEED SIZE/RATING	<u>—</u>			
EXHAUST SIZE/RATING	<u>48" 125#</u>			
PERFORMANCE DATA				
OPERATING CONDITION				
INLET PRESSURE (PSIG)	<u>400</u>			
INLET TEMPERATURE (FTT)	<u>650</u>			
EXT./IND. PRESSURE (PSIG)	<u>100</u>			
EXT./IND. ENTHALPY (BTU)	<u>1243</u>	<u>1243</u>	<u>1250</u>	
BLEED PRESSURE ()	<u>—</u>			
BLEED ENTHALPY ()	<u>—</u>			
EXHAUST PRESSURE ("HgA)	<u>2.5</u>	<u>2.5</u>	<u>2.5</u>	
EXHAUST ENTHALPY (BTU)	<u>1037</u>	<u>1039</u>	<u>1042</u>	
NET FLOW (PPH)	<u>94610</u>	<u>94610</u>	<u>75360</u>	
EXT./IND. FLOW (PPH)	<u>19230</u>	<u>25000</u>	<u>2000</u>	
BLEED FLOW ()	<u>—</u>			
EXHAUST FLOW (PPH)	<u>75360</u>	<u>69610</u>	<u>75360</u>	
TURBINE SPEED (RPM)	<u>3600</u>			
POWER OUTPUT (KW)	<u>6690</u>	<u>6355</u>	<u>6125</u>	
COMMERCIAL DATA				
SHIPMENT (WEEKS)	<u>42</u>			
ESTIMATED PRICE	<u>\$1,350,000</u>			

EXTRACTION

COMMENTS:

Est weight = 90000 LB
Est Dimensions = 37' x 19' x 7'
Est. Freight to Fairbanks = \$40,000
Generator will not be mounted on baseplate.

MURRAY TURBOMACHINERY DIV. IS CERTIFIED TO ISO 9001

CERTIFICATE NO. QSR188



FRY EQUIPMENT CO., INC.

2600 W. 2ND AVENUE SUITE 7 DENVER, COLORADO 80219 PHONE 303-922-8442

FAX: (303) 922-8445

DATE: 18 NOV 94

TRANSMITTED TO: EMC ENGINEERS

ATTENTION: BRAD RYAN FROM: LOW GROUND

SUBJECT: FT. WAINWRIGHT, ALASKA

This Transmission Consists of 6 Pages Including This Page.

Revised Graham Surface Condenser for $1\frac{1}{2}$ " Hg exhaust

ALTERNATIVE 1

RTU - 1 GRAHAM # 5072/25.75 SURFACE
CONDENSER, CAPACITY TO CONDENSE
79,051 lbs/Hr OF SATURATED STEAM,
CREATING A $1\frac{1}{2}$ " Hg INLET VACUUM.
66°F Condenser water inlet, 86°F
Condenser water outlet, w/accessories

Budget Price: \$ 205,000

F.O.B. BATAVIA, NEW YORK

WEIGHT: 51,250 lbs

DIMENSIONS: 31'-3 $\frac{1}{2}$ " LONG X 6' WIDE X 8'-3" HIGH

23 WEEKS LEAD TIME

graham

Vacuum and Heat Transfer
SURFACE CONDENSER SPECIFICATIONS

Customer : EMC ENGINEERS
Cust.Ref.:
Location : FAIRBANKS, ALASKA
Quantity : ONE

Ref.No. : EG157DEN94
Date : 11/18/94
Item : BASE - REVISED
Engineer : SCC157

PERFORMANCE

Absolute Pressure @ Steam Inlet (in.HgA).....	1.50
Steam Condensed (lb./hr.).....	79651.
Heat Rejected (Btu/hr.).....	75668450.
Circulating Water (gpm).....	7567.
Water Inlet / Outlet (deg.F).....	66.00 / 86.00
Water Pressure Loss : (ft.Water / psi).....	24.6 / 10.7
Percent Clean.....	85.
Tube Velocity (fps).....	8.00

DESIGN

	MODEL :	50 72 / 25.75 TALTD
Surface Area (sq.ft.) Total / Effective.....		9192. / 9118.
Number of Water Passes.....		2.
Number of Tubes.....		1818.
Outside Tube Diameter (in.) - BWG.....		0.7500 - 18 AW
Total Tube Length (ft.).....		25.75
Design / Test Pressure (psig) :	Shell.....FV&	15.0 / 22.5
	Tubes.....	75.0 / 112.5
Design Temperature (deg.F) :	Shell.....	250.0
	Tubes.....	150.0
Hotwell : bathtubsupply (min.).....		1.
Steam Inlet (rectangular) (in.) (FF).....		52. x 78.
Water Connections (in.).....		2. - 24.
Condensate Outlet (in.).....		1. - 8.0

MATERIALS

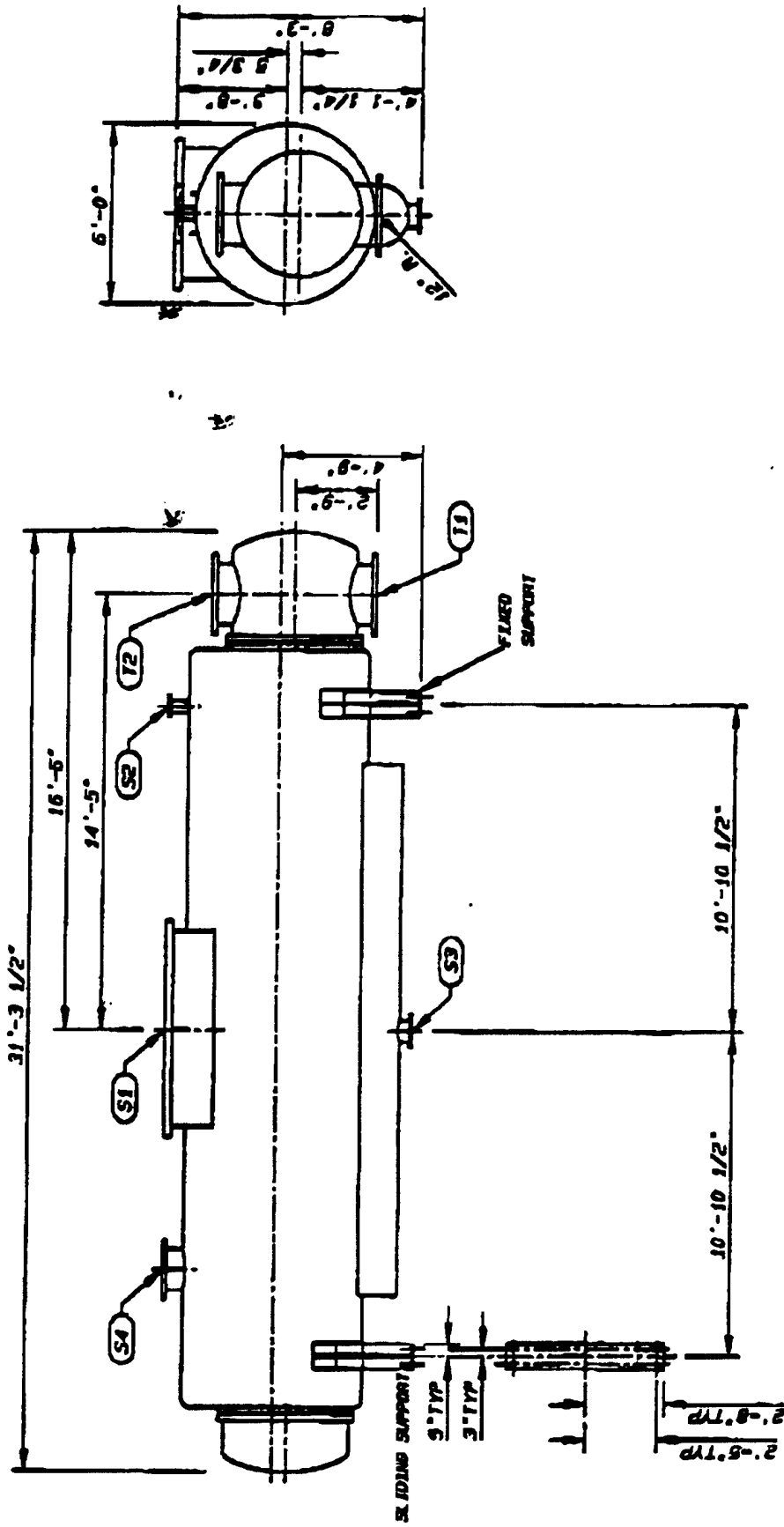
Shell	(SA-516-70)	Carbon Steel
Water Boxes	(SA-516-70)	Carbon Steel
Baffles	(SA-516-70)	Carbon Steel
Tube Support Plates	(SA-36)	Carbon Steel
Tubes	(SB-111-443)	Admiralty
Tube Sheets	(SB-171-464)	Naval Rolled Brass

Remarks : Design per HEI, Eighth Edition

Construction and Stamp per ASME Sect. VIII, Div. 1

Steam Inlet Impingement Protection Included

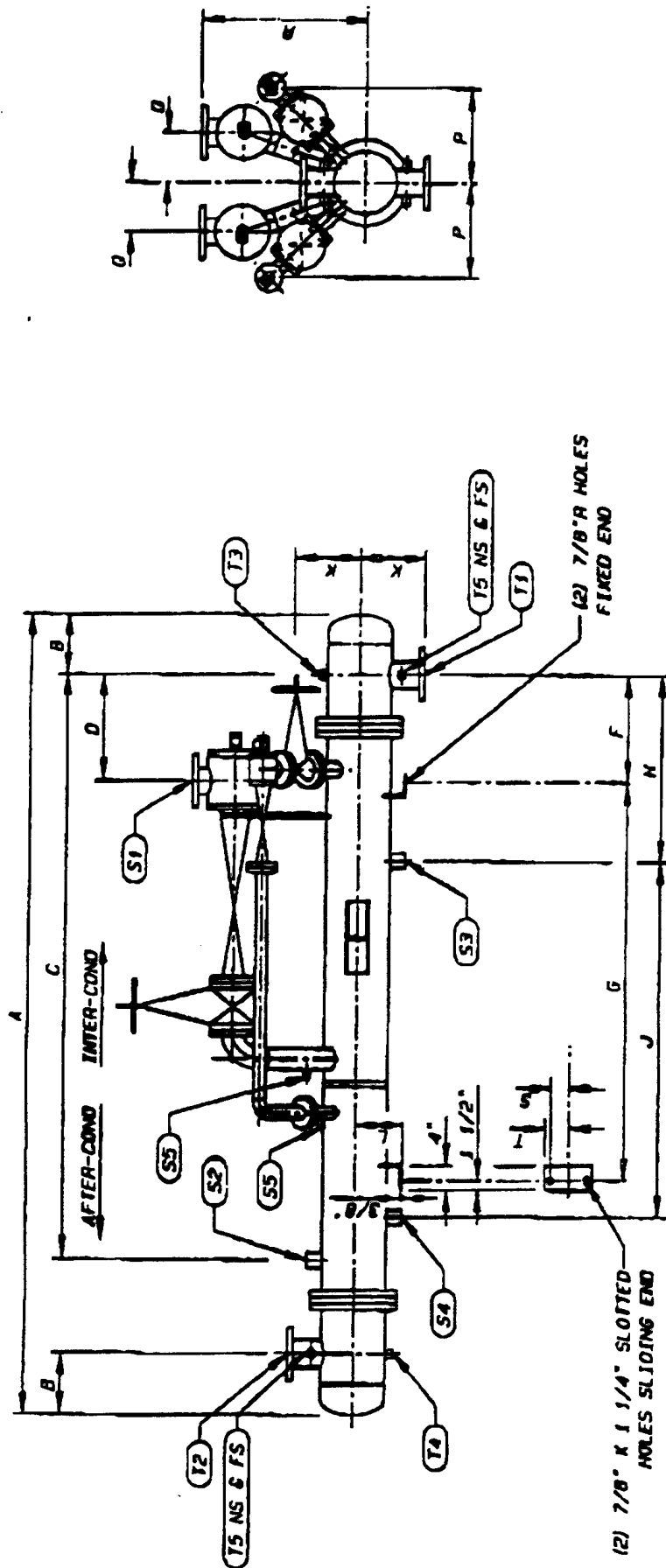
*** PRELIMINARY DRAWING NOT CERTIFIED FOR CONSTRUCTION ***



NOTE:
CONNECTION FLANGES ARE ANSI STANDARD DRILLING AND THICKNESS UNLESS OTHERWISE NOTED.
CUSTOMER TO SPECIFY COOLING WATER NOZZLE ARRANGEMENT.
STEAM INLET FLANGE THICKNESS PER ME1.
SLIDING SUPPORT: (4) 1 1/8" x 1 3/4" SLOTTED HOLES.
FIXED SUPPORT: (4) 1-1/8" DIA. HOLES.

11 24" 150# RF COOLING WATER INLET		CUSTOMER	EMC ENGINEERS	GRAHAM MANUFACTURING CO., INC.	
12 24" 150# RF COOLING WATER OUTLET		CUSTOMER REF.		20 FLORENCE AVE. BAYVIEW N.Y.	
S1 28" x 52" FF STEAM INLET		MODEL	5072/25.75TALTD	PRELIMINARY SURFACE CONDENSER DRAWING	
S2 4" 150# RF AIR OFF TAKE		N.A.M.P.	TEST PRESS.	DATE	DATE
S3 8" 150# RF CONDENSATE OUTLET		SHELL SIDE	FW 15 PSIG	1/88	11/10/94
S4 16" 150# RF RELIEF VALVE		TUBE SIDE	75 PSIG	LBC	AE01570294-3
		DESIGN TEMP	250 F	SCALE	1/88
		150 F	113 PSIG	REV.	

*** PRELIMINARY DRAWING NOT CERTIFIED FOR CONSTRUCTION ***



NOTE:
CONNECTION FLANGES ARE ANSI STANDARD DRILLING AND THICKNESS UNLESS OTHERWISE NOTED.

CUSTOMER ENC ENGINEERS
CUSTOMER REF.
MODEL 2-42-108-1

CONNECTION SCHEDULE		S-SHELL SIDE		T-TUBE SIDE	
SYMBOL	SIZE	TYPE	SERVICE	SIZE	TYPE
S1	4"	150# ANSI (FF)	VAPOR INLET	11'-1"	17 7/8"
S2	1 1/2"	NPT	VAPOR OUTLET	8'-1"	18"
S3	1 1/2"	NPT	CONDENSATE OUTLET	8 1/2"	2'-3 1/2"
S4	1 1/2"	NPT	CONDENSATE OUTLET	16"	3"
S5	1 1/2"	NPT	TEST CONN.	250	150
T1	6"	150# ANSI (RF)	WATER INLET	20	75
T2	6"	150# ANSI (RF)	WATER OUTLET	30	113
T3	3/4"	NPT	VENT	250	150
T4	3/4"	NPT	DRAIN	250	150
T5	3/4"	NPT	TEST CONN.	250	150

DIMENSIONS		TUBE	
A	11'-1"	SH	SH
B	10 3/16"	SH	SH
C	8'-1"	SH	SH
D	17 7/8"	SH	SH
E	18"	SH	SH
F	2'-3 1/2"	SH	SH
G	3'-8"	SH	SH
H	2'-2"	SH	SH
I	4'-11"	SH	SH
J	4'-11"	SH	SH
K	11'	SH	SH
L	8"	SH	SH
M	8 1/2"	SH	SH
N	2'-3 1/2"	SH	SH
O	3"	SH	SH
P	4"	SH	SH
Q	4"	SH	SH
R	4"	SH	SH
S	4"	SH	SH
T	4"	SH	SH
U	4"	SH	SH
V	4"	SH	SH
W	4"	SH	SH
X	4"	SH	SH
Y	4"	SH	SH
Z	4"	SH	SH

GRAHAM MANUFACTURING CO., INC.	
20 FLORENCE AVE. BATAVIA N.Y.	
PRELIMINARY EJECTOR PACKAGE	
SCALE	MADE TO ORDER
DATE	10/27/94
ENG. A	AE61570E
REV.	



Customer : EMC ENGINEERS
 Customer Ref:
 Location : FAIRBANKS, ALASKA
 Item : BASE SELECTION

Ref.No. : EG157DEN94
 Date : OCT 27, 1994
 Engineer: SCC157
 Page : 1

SCOPE OF SUPPLY

Vendors and model numbers are listed to illustrate construction features. Graham reserves the right to substitute equipment of an equal type and quality by other vendors. Any items omitted from this scope of supply list are excluded from this quotation at this time and will not be furnished.

SURFACE CONDENSER TUBED IN SHOP

(1) Model ~~50-66~~ /25 TALTD
~~50~~ 72 /25.75

Drawing AEG157DEN94-1

STEAM JET AIR REMOVAL PACKAGE

(1) Model 2-42-108-1/3H

Drawing AEG157DEN94-A

ATMOSPHERIC RELIEF VALVE

(1) Viking 16" Vertical Carbon Steel

TURBINE TO CONDENSER EXPANSION JOINT

(1) 48" Dia, 18" OAH, SS bellows with liner, FLG x FLG
 Drawing :LATER

HOGGING EJECTOR

(1) Graham, 3H Cast Iron
 (1) Silencer, Maxim, Model 2-1/2" FP Crb.Stl, Internals, Flg./w P.G. Pack

HOTWELL GAUGE GLASS

(1) Consolidated #20-207, Bronze tubular

VACUUM GAUGE(S)

(1) Ashcroft #1279 AS 4-1/2", Bronze tube, Phenol Case, Lower Stem

PRESSURE GAUGE(S)

(4) Ashcroft #1279 AS 4-1/2", Bronze tube, Phenol Case, Lower stem
 (2) Pigtail Syphon, U.S. Gauge, 517H 1/2" Carbon Steel

TEMPERATURE INDICATORS

(4) Ashcroft. 50 EI 60 E060 5" Dial Everyangle 304SS case

AIR LEAKAGE METER

(1) Graham, Calibrated Orifice with gauge, 0 - 40 PPH

LIQUID LEVEL CONTROLLER

(1) Pneumatic Controller, Fisher Model 2500, R249 Displacer Iron Body
 (1) Overboard Valve, Fisher Model 657ED 3" Flanged Cast Iron
 (1) Recycle Valve, Fisher Model 667E2 2" NPT, Cast Iron

INTERCONDENSER CONDENSATE TRAP

(1) Bargo ASTM A126, Type-FA30, 1-1/2"

D-7



Customer : EHC ENGINEERS
Customer Ref:
Location : FAIRBANKS, ALASKA
Item : BASE SELECTION

Ref.No. : EG157DEN94
Date : OCT 27, 1994
Engineer: SCC157
Page : 2

SCOPE OF SUPPLY

Vendors and model numbers are listed to illustrate construction features. Graham reserves the right to substitute equipment of an equal type and quality by other vendors. Any items omitted from this scope of supply list are excluded from this quotation at this time and will not be furnished.

AFTERCONDENSER CONDENSATE TRAP

(1) Sarco ASTM A126, Type-FA30, 1"

RELIEF VALVES

(2) Kunkle Fig. 6010-DC-LM0015, 1/2" Bronze Body

D-8

Alternative 2 Equipment



FRY EQUIPMENT CO., INC.

2600 W. 2ND AVENUE SUITE 7 DENVER, COLORADO 80219 PHONE 303-922-8442

FAX: (303) 922-8445

DATE: 1 NOV 94
TRANSMITTED TO: EMC ENGINEERS
ATTENTION: BRAD RYAN FROM: LOW GROUND
SUBJECT: FT. WAINWRIGHT, ALASKA

This Transmission Consists of 7 Pages Including This Page.

RTU ← ALTERNATE 2

1 - EWING POWER #C-I-30 TURBINE - GENERATOR SET
CAPACITY OF 2930 KW, 4165 BHP. UTILIZING
79,651 LBS/HR OF STEAM @ 10 PSIG EXHAUSTING
TO 3" HgA. 24" INLET, 48" OUTLET, MURRAY
FRAME M4, CONDENSING TURBINE, 4 - STAGES, 3600 RPM
INDUCTION, 460/3/60.

BUDGET PRICE: \$1,075,000

F.O.B. BURLINGTON, IOWA
20 WEEKS

RTU ← ALTERNATE 2

1 - GRAHAM #5066/25 SURFACE CONDENSER, AS PER
ATTACHED DATA SHEETS.

BUDGET PRICE: \$197,000

F.O.B. BATAVIA, N.Y.
48,127 LBS
22 WEEKS

NOTE: WE ARE ALSO HAVING MURRAY TURBINE PROPOSE A T/G SET,
HOPE TO HAVE THEIR PROPOSAL IN ONE WEEK

Graham
Vacuum and Heat Transfer
SURFACE CONDENSER SPECIFICATIONS

ALTERNATE

~~1~~ 2

Customer : EMC ENGINEERS
Cust. Ref.:
Location : FAIRBANKS, ALASKA
Quantity : ONE

Ref. No. : EG157DEN94
Date : 10/27/94
Item : BASE SELECTION
Engineer : SCC157

PERFORMANCE

Absolute Pressure @ Steam Inlet (in. HgA).....	3.00
Steam Condensed (lb./hr.).....	79631.
Heat Rejected (Btu/hr.).....	75668450.
Circulating Water (gpm).....	7567.
Water Inlet / Outlet (deg. F).....	90.00 / 110.00
Water Pressure Loss : (ft. Water / psi).....	22.8 / 9.9
Percent Clean.....	85.
Tube Velocity (fps).....	8.00

DESIGN

Surface Area (sq. ft.) Total / Effective.....	MODEL : 50 66 / 25.00 TALTD
Number of Water Passes.....	8924. / 8806.
Number of Tubes.....	2.
Outside Tube Diameter (in.) - BWG.....	1818.
Total Tube Length (ft.).....	0.7500 - 18 AW
Design / Test Pressure (psig) : Shell.....	25.00
Design / Test Pressure (psig) : Tubes.....	FV& 15.0 / 22.5
Design Temperature (deg. F) : Shell.....	75.0 / 112.5
Design Temperature (deg. F) : Tubes.....	250.0
Hotwell : bathtub supply (min.).....	150.0
Steam Inlet Diameter (in.) (PF).....	1.
Water Connections (in.).....	48.
Condensate Outlet (in.).....	2. - 24.
	1. - 8.0

MATERIALS

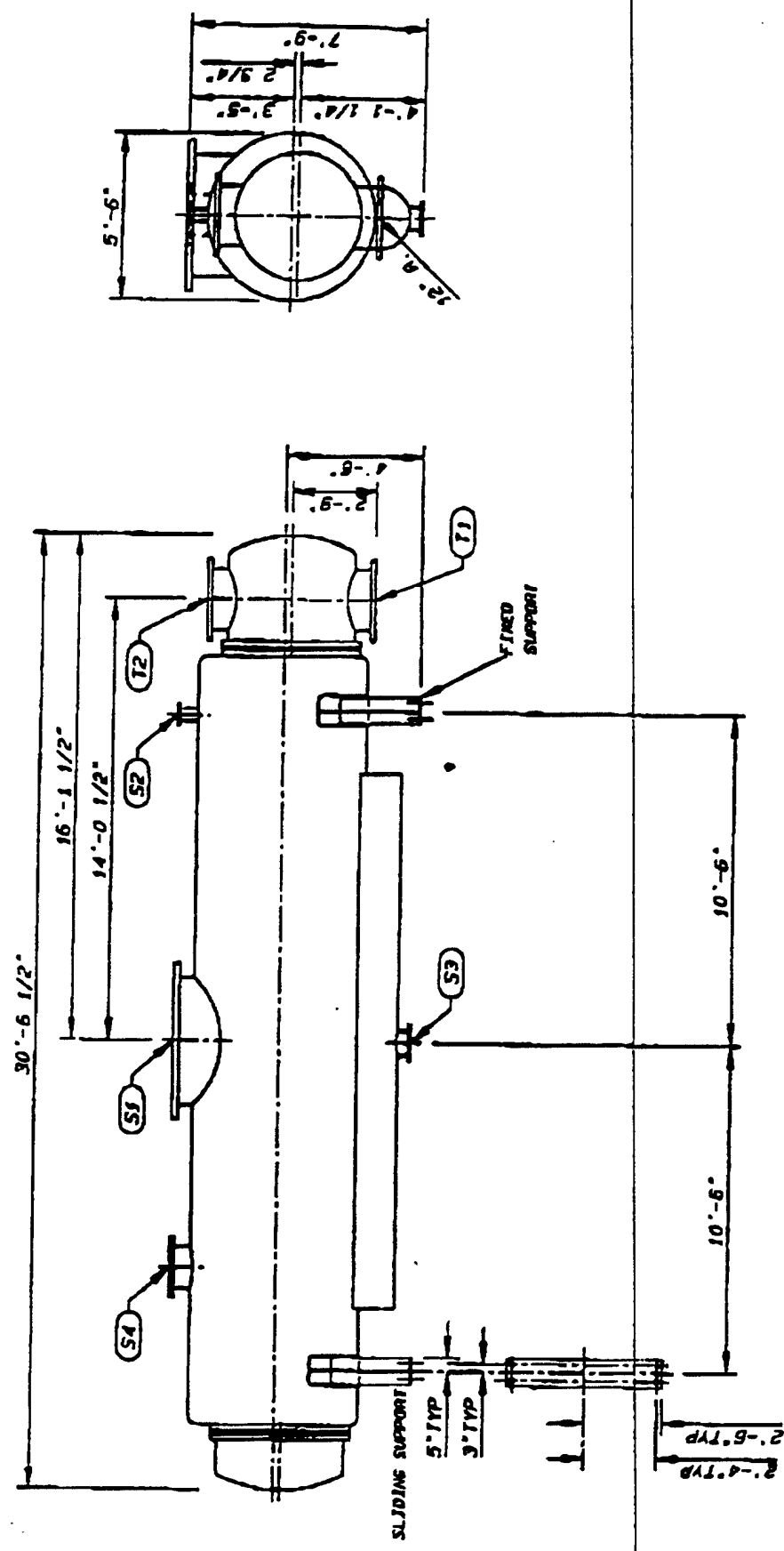
Shell.....	(SA-516-70)	Carbon Steel
Water Boxes.....	(SA-516-70)	Carbon Steel
Baffles.....	(SA-516-70)	Carbon Steel
Tube Support Plates.....	(SA-36)	Carbon Steel
Tubes.....	(SB-111-443)	Admiralty
Tube Sheets.....	(SB-171-464)	Naval Rolled Brass

Remarks : Design per HEI, Eighth Edition

Construction and Stamp per ASME Sect. VIII, Div. 1

Steam Inlet Impingement Protection Included

*** PRELIMINARY DRAWING NOT CERTIFIED FOR CONSTRUCTION ***



NOTE:
CONNECTION FLANGES ARE ANSI STANDARD DRILLING AND THICKNESS UNLESS OTHERWISE NOTED.
CUSTOMER TO SPECIFY COOLING WATER NOZZLE ARRANGEMENT.
STEAM INLET FLANGE THICKNESS PER MET.
SLIDING SUPPORT: (4) 1 1/8" x 1 3/4" SLOTTED HOLES.
FIXED SUPPORT: (4) 1-1/8" DIA. HOLES.

Graham Manufacturing Co., Inc.		20 FLORENCE AVE. BATAVIA N.Y.	
PRELIMINARY SURFACE CONDENSER DRAWING		DATE	
SCALE	MADE	CHKD	APPD
1/66	SDC		
10/27/94			
DESIGN NO.		REV.	
AEG157DENS4-1			

T1	24"	1500 RF COOLING WATER INLET	CUSTOMER	EMC ENGINEERS
T2	24"	1500 RF COOLING WATER OUTLET	CUSTOMER REF.	
S1	48"	FF STEAM INLET	MODEL	5066/25.00TALD
S2	4"	1500 RF AIR OFF TAKE	H.A.M.P.	TEST PRESS.
S3	8"	1500 RF CONDENSATE OUTLET	SHLL SIDE	23 PSIG
S4	16"	1500 RF RELIEF VALVE	TUBE SIDE	113 PSIG
			DESIGN TEMP	250 F
				150 F



ADDENDIX E
CORRESPONDENCE AND FIELD NOTES

REVIEW COMMENTS

PROJECT NO: DACHN-99-0-53 PROJECT TITLE: Limited Fire up study, low pressure tubing LOCATION: F-24

SHT / UP /

AGENCY:

- ☐ ENGINEERING
☒ O & M
☐ FIRE DEPT.

- ☐ ENVIRONMENTAL
☐ HOUSING
☐ SAFETY

- ☐ PHYSICAL SECURITY
☐ ENVIRONMENTAL HEALTH
☐ INDUSTRIAL HYGIENE

- ☐ COMMUNICATIONS
☐ USING AGENCY
☐ CONTRACTING

Drawings Site No. Spec. Para.

Class No.

COMMENTS

DESIGN STATUS:

- ☐ CONCEPT
☒ 60 %
☐ FINAL

DATE: 25 JAN 95
 REVIEWER: Paul Knorr
 PHONE: 344-3042

REVIEW ACTION

DESIGN ACTION

Back Check

1	Pr. 3-1	last Para.	We do not get seasonal relief from GVEA.	CONCUR	Will Delete	PR
2	Pr. 3-2	7th Para	The power generation cost of \$100 per kWh is too high. Calculations assumed a pure condensing system. It never works that way, we are always extracting some steam.	CONCUR	Will Revise	PR
3	General		The condenser tubes are cleaned more often than stated in the summary. More like once a week.	DISAGREE	PG: Appendix E Confirmed Notice 1 #26	PR
4	General		Cost of Condensate make-up should be figured in.	DISAGREE	1st Will Be Back UP - CONDENSATE MAKE UP WILL BE THE SAME	PR
5	General		Cost of Power purchased at Fort Greely from GVEA should be considered in calculations.	CONCUR	FT - GREELY COSTS WILL BE INCLUDED IN THE REPORT	PR

PROJECT: Low Pressure Turbine

DATE: 01/23/85

REVIEWER: Pat Dittol

LOCATION: Fort Wainwright Alaska

PHONE: (907) 353-7141

APVR-WFW-O

COMMENTS

It is stated that "...Fort Wainwright must become independent of GVEA to fully realize the energy savings...". This however will not be possible without first implementing one of these alternatives. This should be written as to state that with the implementation of one of these projects, Fort Wainwright will be able to become independent of GVEA and thus will not incur the contract minimums.

Page 3

Dwg. Sht.
Spec. Para.

Item
No.

1

A/W

A -
COMMENT
ACCEPTED

C-Corrected

C - THE REPORT WILL
BE CORRECTED

Back

Checked

BR

COMMENTS

PROJECT: JH C 701-74-0000

LOCATION

Date: 1-24-95

Reviewer: D JAEKE

Phone: 353 7143

☐ Air Force

☒ Army

☐

Design Document

Arch./LA

☐ D. Memo

☐ Concept

☐ Prelim.

☐ Final

☐ Cr./San.

☐ Mech./Elec.

☐ Struct.

COMMENTS

Drawing Sht
Spec Para.

Table 1

RECOMMEND ALTERNATIVE #1 TAKE OUT
EXISTING #1 TURBINE AND REPLACE WITH
CONDENSING TURBINE DUE TO COMPLEXITY
OF ALTERNATIVE #2. ALSO LIMITED SPACE
FOR ADDITIONAL TURBINE.
ON PARA. 3.2 10 KWH ESTIMATED COST FOR
PRODUCING ELECTRICAL ENERGY AT
FURNACE REPORT IS ALONG AS TOTAL
STEAM THROUGH TURBINE = STEAM FOR
BASE HEAT + STEAM FOR ELECTRICAL PRODUCTION.
I BELIEVE AN CLOSER ESTIMATE IS 0.045, 201
KWH.

3.2

Action taken on comment by:

DESIGN OF

REVIEW CONFERENCE

A - comment accepted

W - comment withdrawn

(If neither, explain)

C - correction made

(If not, explain)

Back
check
by:

(Initials)

BR

BR

COST WILL BE CHARGED
TO 6.06/KWH

SHT. OF

20-777 3031-5

NFD FORM 32 (Rev) Nov 77 Replaces NFD FORM 32 1977 After Current Supply Exhausted.

REVIEW COMMENTS

PROJECT: *LIMITED ENERGY STUDY - LOW PRESS. LOCATION: FT W, 1.*

☐ NP ☐ Air Force ☐ Army ☐

Date: *1-18-95*

Reviewed: *Von Gunther*

Phone:

Design Document

☐ D. Memo ☐ Concept ☐ P&S ☒ Prelim ☐ Final

☐ Arch./LA ☐ Civ./San ☐ Mech./Elec ☐ Stud

Item No.

Drawing Sht. Spec. Para.

COMMENTS

1. Based on the original scope of work ALTERNATIVE #1 is the best solution.

2. I'm not sure what the intent of this request is but the additional consideration mentioned in para. 6.2. Recommendation may be worth looking into. UGEL's Recommendation.

DESIGN OFFICE

C. correction made

(If not, explain)

REVIEW CONFERENCE

A. comment accepted

W. comment withdrawn

(If neither, explain)

Back check by:

(Initial)

MOBILE DISTRICT PROJECT REVIEW COMMENTS		Date: 17 Jan 95	Page 1 of 1
Jan Lenz Alaska District CENPA-EN-TE-DM		From: (Section) CESAM-EN-DM (Reviewer) A. Battaglia 334-690-2618	
Project: FY94 Limited Energy Study (LP Turb) Location: Fort Wainwright, AL		Year: FY-94	Line Item No.:
Type of Action: Interim Submittal Review			
ITEM NO.	DRAWING NO. OR PAR. NO.	COMMENTS	REVIEW ACTION

1. Page 4.2 Figure 4-1: Identify the new piece of equipment shown below the turbine generator. CONCUR - Fig. 4-1 Will BE CORRECTED, BR

2. General Earlier today I had a conversation with Dennis Jones of EMC Engineers, in which he told me that they had received additional information on the Fort Wainwright electrical power rates from the electric utility company. I asked Mr. Lenz to pursue this point during the review meeting, to find out if this new information would have an effect on the outcome of the analysis, and to be sure that the final report documented all findings. CONCUR - THE ADDITIONAL INFORMATION HAS BEEN INCLUDED INTO THE FINAL REPORT, (GIVEN CONTRACT $\frac{1}{2}$ FT GREENLY ENERGY COSTS). BR

- General The report covered the question posed in the scope of work very well. It also generated some questions about the operation of the electric generating plant that probably deserve additional study; however, this additional study would not be covered under the scope of work for the current delivery order. If the customer wants to pursue the additional investigation, it should be included in the request for FY96 BEAP studies. CONCUR - PER REVIEW MEETING OF 31 JAN 95, THE CUSTOMER WOULD LIKE TO PURSUE ADDITIONAL INVESTIGATIONS, EMC REQUESTS DIRECTION, BR

Tuesday January 24, 1995

Page: 1

Turbine Study, Ft Wain

File: N:\ARMS\E2\FTW14195.DBF

Num	Name	Office	Page/Sheet	Discipline	Rm/Detail
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- | | | | | | |
|---|--------------|------------------|-----|--|--|
| 1 | BOLTON, R.L. | NPAENTE-EL APP B | ELE | | |
| <p>Estimated cost of the power plant should use their published cost. Calculations do not appear to consider plant efficiency. Part of the cost of generation is the loss through the plant, and the new work should share this cost. Consider also increase plant maintenance due to increased production.</p> <p>CONCUR. ESTIMATED COST WERE REVISED TO AGREE WITH PUBLISHED COST. BR</p> | | | | | |
| 2 | BOLTON, R.L. | NPAENTE-EL APP B | ELE | | |
| <p>Utility bill dated August 4, 1994 implies that peak electrical usage was 7120 KW. since the study is proposing a 5400kw capacity increase, it appears GVEA will be required to supply power, probably when a turbine is down for repair. Modify study to show this cost.</p> <p>DISAGREE. WHEN TG-1 IS INSTALLED, GVEA WILL NOT BE REQUIRED TO SUPPLY POWER; THERE WILL BE (3) 5 MW TURBINES AVAILABLE. BR</p> | | | | | |
| 3 | BOLTON, R.L. | NPAENTE-EL APP C | ELE | | |
| <p>First page of LCC Analysis shows SIOH at 5.5%. Believe this should be higher, as the Corps' S&I is 8.5%.</p> <p>CONCUR. SIOH WILL BE CHANGED TO 8.5% BR</p> | | | | | |
| 4 | BOLTON, R.L. | NPAENTE-EL APP C | ELE | | |
| <p>First page of LCC Analysis shows design cost of 5.5%. Corps design cost BY LAW, AE FIRMS or on would show cost above 7%. Verify design cost, or use Corps on.</p> <p>100% THE DESIGN COST WILL BE CHANGED TO 6%. BR</p> | | | | | |
| 5 | BOLTON, R.L. | NPAENTE-EL APP C | ELE | | |
| <p>TG-1 maintenance cost shows 40 hr/yr turbine maintenance. Verify that this cost includes any rebuilds if required over the 20 years. List source of information for all numbers used. In this case, where did 40hr/yr come from?</p> <p>BE! APPENDIX C RECORDS & VERBAL QUOTE. THIS GIVES MAINTENANCE DATA FROM THE TURBINE-GENERATOR MANUFACTURER. BR</p> | | | | | |

COMMENTS

PROJECT: LOW PRESSURE TURBINE

LOCATION: FT. WINNDAIGH

<input type="checkbox"/> NP <input type="checkbox"/> Air Force <input type="checkbox"/> Army <input checked="" type="checkbox"/> EN-CE		Date: 01/31/95 Reviewer: J. WILLIAMS Phone: 907 753-5676	Design Document <input type="checkbox"/> D. Memo <input checked="" type="checkbox"/> Concept <input type="checkbox"/> P & S <input type="checkbox"/> Prelim. <input type="checkbox"/> Final	<input type="checkbox"/> Arch./LA <input type="checkbox"/> Civ./San. <input type="checkbox"/> Mech./Elec. <input type="checkbox"/> Stud.	Action taken on comment by: REVIEW CONFERENCE A - comment accepted W - comment withdrawn (If neither, explain)	DESIGN OFFICE C - correction made (If not, explain)	Bad check by: (Initial)
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Item No.	Drawing Sht. Spec. Para.	COMMENTS	REVIEW CONFERENCE	DESIGN OFFICE	Bad check by:
1.		THESE COMMENTS APPLY TO ALTER. 1 AND ALTERNATE 2. FOR PROGRAMMING PURPOSES ESCALATION SHOULD BE ADDED TO INCLUDE DATE OF ESTIMATE TO MID-POINT OF CONSTRUCTION. REFERENCE "TRI-SERVICE MILITARY CONSTRUCTION PROGRAM INDEX" FOR FY 1995. THEN FY 2001 PROGRAMS, DATED 24 JAN 94.	A	C ESCALATION WILL BE INCLUDED	PR
2.		NETHER ESTIMATE HAS OWNER COSTS REQUIRED FOR PROGRAMMING. OWNER CONTINGENCY SHOULD BE 10% FOR REMODEL WORK OR 5% FOR NEW WORK. DUE TO THE NATURE OF THIS WORK, WE RECOMMEND 10%.	A	10% CONTINGENCY IS APPLIED TO AUG 1 20% CONTINGENCY IS APPLIED TO AUG 2	PR
3.		OWNER SUPERVISION INSPECTION AND OVERHEAD IS 8.5% FOR O&M WORK OR 6.5% FOR M&A WORK. THIS COST SHOULD BE ADDED.	A	C 8.5% WILL BE CHARGED TO 8.5%	PR
4.		THE OVERHEAD & BOND FOR THE PRIME CONTRACTOR IS SHOWN AS 15%. IF THIS INCLUDES FIELD OFFICE COSTS, IT APPEARS OK.	A	NO CHARGE REQUIRED	PR
5.		THE PRIME CONTRACTOR PROFIT OF 10% IS NOT IN ACCORDANCE WITH THE WEIGHTED GUIDELINES, AND REQUIRES ADJUSTMENT	A	C THE PROFIT WILL BE CHARGED AS REQUESTED	PR

OPTIONAL FORM 86 (7-90)

FAX TRANSMITTAL

of pages 2

To: PRAP RAN	For: TAN LAR
Date: 01/31/95	Phone: 907.753.5676
Fax: 907.753.5676	Fax: 907.753.5676

NFD FORM 32 (Rev) Nov 77 Replaces NFD FORM 32 1977 After Current Supp

GENERAL SERVICES ADMINISTRATION

COMMENTS

PROJECT: LOW PRESSURE TURBINE

PAGE 6 OF 6

LOCATION: FT. WAINWRIGHT, J

<input type="checkbox"/> NP <input type="checkbox"/> Air Force <input type="checkbox"/> Army <input checked="" type="checkbox"/> EN-SE		Date: 01/31/95 Reviewer: J. WILLIAMS Phone: 907 753-5676	Design Document <input type="checkbox"/> D. Memo <input checked="" type="checkbox"/> Concept <input type="checkbox"/> P & S <input type="checkbox"/> Prelim <input type="checkbox"/> Final	<input type="checkbox"/> Arch./LA <input type="checkbox"/> Civ./San. <input type="checkbox"/> Mech./Elec. <input type="checkbox"/> Struct.	Action taken on comment by REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	DESIGN OFFICE C - correction made (if not, explain)	Ba ch by (initial) BCR
Item No. 6.		COMMENTS OFFICE DEMONSTRATION OF BONDS IS RESPONSIBLE 1600/HQ. IS MUCH TOO LOW. THIS MIGHT SUGGEST THAT THE ESTIMATE IS NOT USING CURRENT AK DAVIS-BACON RATES. LAST ITEM					

NPD FORM 32 (Rev) Nov 77 Replaces NPD FORM 32 1977 After Current Supply Exhausted.

SMT. OF

CONFIRMATION NOTICE

Confirmation No. 1

EMC #1406-002

November 1, 1994

PROJECT: Limited Energy Study, Low Pressure Turbine, Ft. Wainwright, AK
CONTRACT No.: DACAO1-94-D-0033

NOTICE: Brad Ryan
PREPARED BY: E M C Engineers, Inc.

SUBJECT: Meeting Notes

ATTENDEES: Dan Lenz, COE, AK District Brad Ryan, EMC
Paul Knauff, Public Works Ray Anderson, EMC
Pat Driscoll, Public Works-Utilities

The following is a summary of the items discussed, the comments made, and the decisions made during a meeting held at the Ft. Wainwright Power Plant on 26 October 1994. The meeting was held during the week of the site visit. The site visit was to obtain drawings, plant data and observe the conditions of the plant.

1. General

- A. The project consists of a study of an existing back pressure steam turbine-generator (TG-1). In general, the scope of work requires EMC to study adding a new turbine-generator which will receive the exhaust steam from the existing back pressure turbine-generator.

2. Existing Conditions

- B. TG-1 is a 5 MW nominal (6.25 MW max. capacity) back pressure turbine-generator with an additional high pressure (100 psig) steam extraction. The back pressure (turbine exhaust) is 10 psig and was intended to be used for in plant heating processes. However, the power plant does not have a need for the 10 psig exhaust steam. The 100 psig extraction is used for heating buildings at Ft. Wainwright.

TG-1 is not used except in cold (-30 F) weather conditions when there is a high demand for steam heating.

TG-2 is not used and is not considered operational.

2. Assumptions and Decisions

- A. It is not necessary to have a 10 psig steam supply (exhaust or extraction) from TG-1. There is an additional 10 psig steam supply within the plant. The 100 psig extraction steam from TG-1 will not be required all of the time and may be shut off.
- B. After review of the existing conditions, it appeared that the study should include the option of replacing TG-1 with a condensing turbine-generator. The new condensing turbine-generator will have a 100 psig extraction that will be able to be shut off.
- C. EMC is to assume that there is adequate condensing capacity for the new condensing turbine-generator. The cost estimate will include new condenser water piping and pumps as necessary for the new turbine-generator condenser. Costs for upgrading the main plant condenser cooling water system will not be included. There is currently a project designed by another A/E firm that will upgrade the main plant condenser cooling water system.
- D. The EMC report format is to use English units. This is due to the fact that the existing drawings and plant data is in English units. It would be some what confusing to compare new data in Metric units to existing data in English units.
- E. Turbine-generators TG-3, TG-4 and TG-5 are each rated at 5 MW nominal (6.25 MW max capacity). EMC was advised that when TG-3, TG-4, and TG-5 are operating, the power required for Ft. Wainwright and Ft. Greedy can be generated with out purchasing power from Golden Valley Electric Association (GVEA).
- F. TG-3, 4 and 5 must be taken off line periodically to clean the condenser tubes. During this down time, Ft. Wainwright must buy electrical power from (GVEA) because TG-1 is not operational..
- G. EMC is to assume that each condenser will be cleaned twice a month in the summer and twice a month in the winter. The time period for cleaning the condenser will be assumed to be 18 hours.
- H. Installing the new TG-1 will help ensure that three turbine-generators are operational when maintenance for one turbine-generator condenser is necessary. Consequently, cost savings will result by installing the new turbine-generator because the government will avoid buying electrical power during the down time for cleaning the condenser. The existing electric bills from GVEA will be used for cost history. The bills from the past 12 months will be used for cost savings data in the report.
- I. It is not anticipated that the electrical generation capacity required from the Ft. Wainwright Power Plant will increase in the future. Therefore, three nominal 5 MW (6.25 MW max capacity) turbine-generators will be adequate to meet the present and future demand.

2. Clarification Items.

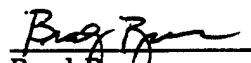
- A. EMC is to submit a sample of the EMC standard cost estimating format to COE, AK District for approval. It is anticipated that this format will be better suited for the report instead of using MCACES-GOLD.
- B. Ft Wainwright personnel are to provide to EMC approximate operating hours on Turbine No. 1. so that a salvage value can be obtained.
- C. COE, AK District will send to EMC the Davis-Bacon wage rates for Fairbanks, AK area, and will also advise which fiscal year to use for the ECIP life cycle cost analysis summary.

3. Scheduled Correspondence

2 December 94 Interim Report Submittal

January 95 Review Conference (actual time and place to be determined)

Final report submittal 21 days after Review Conference


Brad Ryan

cc: Meeting Attendees
Doug Gray, EMC
Dennis Jones, EMC

If any portion of this confirmation notice is incorrect, please notify us immediately. If correspondence is not received to the contrary within 14 days, it will be assumed that the decisions, conclusions, and status outlined in this confirmation notice are correct.

RECORD OF TELEPHONE CONVERSATION

Date 11/24/94 Time 11:30 ☒ AM ☐ PM
 Call to ☐ Call from ☒ Name DARELL JACQUE
 Company FT. WASHINGTON TOWER STUDY Phone No. (957)
 Project LOW PRESSURE TURBINE STUDY Project No. 146-002
 Regarding PLANT DATA

This memorandum confirms the conversation of PLANT DATA between
DARELL and BRAD in which it was said:

COAL COST: \$45/TON

COAL HEATING VALUE 7800 BTU/LB

T6-1 OPERATING HOURS: 184 MONTHS

Action to be taken / decisions made

REPORT DEVELOPMENT

Signed

By [Signature]

Distribution

Owner

()

Contractor

()

PIC

()

File

☒

Project Manager

☒

()

RECORD OF VERBAL QUOTE

Quote No. 1

Date: 21 NOVEMBER

Company: WABASH

Location: WHEELING, IL

Telephone No: (708) 541-5600

Person Talked to: RICHARD CATTUG

Scope/Description/Amount of Quote: ESTIMATED SALVAGE VALUE
OF EXISTING TG-1, GE 5 MW BACKPRESSURE
TURBINE-GENERATOR, 189 MONTHS (14,616 HRS) OF OPERATING
HOURS;

ESTIMATE RANGE OF SALVAGE VALUE IS \$40,000 TO \$80,000

→ FOR REPORT, USE \$40K

Type of Quote: ☒ Material Cost only (FOB Point: MA)
☐ Labor Cost Only
☐ Installed Cost

Sales Tax: ☐ Included, Rate _____ %
☒ Not Included

Project: LOW PRESSURE TURBINE SNOW EMC # 1406-002

Location: FT. WAINWRIGHT, FAIRBANKS, ALASKA

Quote Received By: BRAD RYAN

E M C ENGINEERS, INC.
 2750 S. Wadsworth Blvd. 9755 Dogwood Rd.
 Suite C-200 Suite 220
 Denver, CO 80227 Roswell, GA 30075
 (303) 988-2951 (404) 642-1864

JOB FT WADSWORTH FIELD MTS
 SHEET NO. _____ OF _____
 CALCULATED BY PA DATE _____
 CHECKED BY _____ DATE _____
 SCALE _____

	FROM TURBINE - GENERATOR END	CANCEL	PANEL 5	
	# 5		# 4	# 3
INLET PRESSURE:	400 PSIG		400	400
EXTRACT PRESSURE:	32 PSIG		80	80
TURBINE VACUUM	25 PSIG		25	25
SPEED	3600 RPM		3600	3600
INLET TEMP (base)	710 OF		705	695
STEAM CHART RECORD				
STEAM TEMP:	~ 650°F		—	680
STEAM FLOW:	25,000 - 40,000 $\frac{lb}{hr}$		125,000 - 150,000 $\frac{lb}{hr}$	115,000 - 135,000 $\frac{lb}{hr}$

E M C ENGINEERS, INC.

2750 S. Wadsworth Blvd. 9755 Dogwood Rd.
Suite C-200 Suite 220
Denver, CO 80227 Roswell, GA 30075
(303) 988-2951 (404) 642-1864

JOB FT. WANNUMCRAFT FIELD NOTES
SHEET NO. 1 OF 1
CALCULATED BY BR DATE 26 OCT 94
CHECKED BY _____ DATE _____
SCALE _____

DERRELL SAEKE - OPERATIONS FOREMAN - 353-7143

PAT DUSCH

420 psi 720 °F

4¢/kW FT. WANNUMCRAFT (VERIFY)

9¢/kW PUBLIC UTILITY (RE: UTILITY RATES)

#1 GE TURBINE-GENERATOR
NO. 104771

RATED 5000 KW 7 STAGES
SPEED 3600 RPM MAX CAPACITY 6250 KW
STM. PRESSURE 400 PSIG TEMP 650°F EXH. PRESS 10" H₂O

AC GENERATOR

NO 6978228 AIR COOLED TYPE ATB
2 POLES 60 CYCLES 3 PH DELTA/WYE
CONNECTED FOR 7200/12470 VOLTS

RATING 6250 KVA @ 0.8 PF EXCITER 125 VOLTS
ARMATURE 501/259 AMP FIELD 185 AMP

E M C ENGINEERS, INC.

2750 S. Wadsworth Blvd. 9755 Dogwood Rd.
Suite C-200 Suite 220
Denver, CO 80227 Roswell, GA 30075
(303) 988-2951 (404) 642-1864

JOB FT. WASHINGTON FIELD MOTOR

SHEET NO. _____ OF _____

CALCULATED BY BR DATE _____

CHECKED BY _____ DATE _____

SCALE _____

#3 TURBINE - GENERATOR

MOTOR NO. 104768

RATED 5000 KW

TURBINE 10 STAGES

SPEED 3000 RPM

MAX CAPACITY 6250 KW

STEAM PRESSURE 400 PSIG TEMP 650 °F EXH. PRESSURE $1\frac{1}{2}$ " HG

A-C GENERATOR

No. 6978225

AIR COOLED

TYPE ATB

2 POLES

60 CYCLES 3 PH DELTA/STAR CONNECTED FOR 720/1247.6V

RATING 6250 KVA @ 0.8 PF EXCITER 125 VOLTS

ARMATURE 501/289 AMP FIELD 185 AMP

GUARANTEED TEMP RISE NOT TO EXCEED 60 °C ON ARMATURE BY
DETECTOR, 85 °C ON FIELD BY RESISTANCE

SEE INST. GEI-35391

#4 TURBINE GENERATOR

STEAM TURBINE NO. 104769

SAME AS #3 ABOVE

GENERATOR NO. 6978226

SAME AS #3 ABOVE

#5 TURBINE GENERATOR

MOTOR NO. 104770

SAME AS #3 & #4

GEN NO. 6978227

" " " " " "